UGUST Summer Hints 25 CENTS

POPULAR MECHANICS MAGAZINE

WRITTEN SO YOU CAN UNDERSTAND IT

REG. TRADE MARK GREAT BRITAIN, INC. 1928

FOUR YEARS AT ANNAPOLIS

SEE PAGE 193

McSweeny will pull you out of the Ruck and help you make BIG MONEY

J. H. McSweeny "MAC"

You can earn $100 a week

You'd like to earn $100 or more a week—or be your own boss—wouldn't you? All that I ask you to do now is simply to spend 2 cents—one postage stamp—and let me show you how McSweeny training is helping others make big money.

Success Follows McSweeny Training

This is a special message to red-blooded, two-fisted fellows who know they've got the stuff in them. You know what I mean. You're not satisfied. You see others around you making big money. You've got your eye open for the big chance. *This is it.* Listen to what George Smith of West Alexandria, Ohio, did. He was getting only $75 a month.

"Dear Mac:
"I am certainly grateful to you for the success I've had. If it hadn't been for you and your training, I'd still be plugging along on the farm. Now I can laugh at those fellows who told me I was foolish to quit the farm. *I am clearing $800.00 a month.* I'll tell the world McSweeny training put me over."

I can show you hundreds of just as enthusiastic letters from men who had been clerks, mechanics, farm boys, shop workers, of all ages—16 to 65.

Opportunities for McSweeny-Trained Men

Automobiles are increasing at the rate of three million a year. The need for auto experts never was so great. Not just mechanics, but experts, skilled in auto electricity, starting and lighting, ignition, batteries, and all kinds of automobile repairing and trouble shooting—experts, with ability to direct men and operate a garage business profitably.

Complete Training in Only Eight Weeks

The automobile industry everywhere is eagerly seeking trained auto experts. McSweeny men have shown that they know their stuff. Many own their own garages now. You can get this complete training—*the start to success*—in only 8 weeks. It isn't book training—it's actual job work in McSweeny's big graduate shops. The instructors are all specialists—the pick of the industry. Equipment is modern and complete—autos, trucks, tractors, and stationary engines.

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FREE Automobile Dictionary

FREE Course in Electricity

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A BIG SURPRISE

The Special Summer Offer

WRITE TODAY

and I'll tell you all about it

act now

SEND FOR FREE BOOK

MAIL THIS COUPON TODAY

J. H. McSweeny, President, Dept. 140, McSweeny Automotive and Electrical Training Shops, 9th and Walnut Streets, CINCINNATI, O. 517-521 South Laflin Street, CHICAGO, ILL. 1815 E. 24th St., Cleveland, O.

Dear "Mac:" Send me full details on your Special Summer Offer.

Name.....

Address.....

McSWEENY AUTO and TRACTOR GRADUATE SHOPS

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THREE BIG SHOPS—*Write to the nearest one*

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Popular Mechanics Magazine
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Vol. 44 AUGUST, 1925 No. 2

Character Analysts Claim Eyes Such as These, Set Fairly Close Together, Indicate Their Owner Is Poorly Balanced, Excitable and Underhanded, But This Man Isn't

Does Your Face Reveal Your Character?

Science Answers "No" and Shows That the Appearance and Shape of Face and Head Have Nothing to Do with Personal Traits

By Dr. A. J. SNOW
(Professor of Psychology, Northwestern University)

THAT the intelligence of a person can be judged by his appearance, the shape of his head or the features of his face has been disproved by experiments conducted by Professors Donald A. Laird and Herman Remmers, of Colgate University, Glen U. Cleeton, of the Carnegie Institute of Technology, and F. B. Knight of the University of Iowa.

In one test, pictures were submitted to 376 persons and their estimates of the intelligence and abilities of the ten subjects were compiled. The results showed that in attempting to arrange the pictures according to relative intelligence they could have done as well with their eyes closed. Women among the judges were no better than men, and both men and women judges showed a tendency to overrate the intelligence of girls pictured. Older persons were no better judges than younger, and the more intelligent among the judges were no better at judging the intelligence of others. Groups of from two to five judges working together got no better results than single individuals and as a climax one professional "character reader and vocational expert" scored no better as a judge than the average of the entire 376 persons.

In another experiment, two groups of sorority girls, ten in each group, and one group of ten fraternity boys were selected as subjects. Friends of the thirty then gave their opinions as to the intelligence, frankness, will power, ability to make friends, leadership, originality and impulsiveness of the subjects under observation. These opinions were found to agree very closely except in the cases of frankness and ability to make friends. Indications on the whole, however, were that these acquaintances had the subjects correctly classified

Next a large number of business men, school teachers, employment managers and others used to meeting strangers and judging them from their appearance were given a look at the thirty, one at a time, and their impressions compared. Their

opinions agreed very well with each other, but did not agree with the estimates of the friends who really knew the subjects.

Following this, the investigators tried character analysis. From a large number of books on the subject they compiled standard data on how to tell character by the shape of the head, and the relative proportions of the features. They measured every conceivable angle and dimension of the thirty faces and computed the result according to the data in the best advertised character-analysis books. The final result was that the results computed according to these rules agreed neither with the analysis of the friends who really knew the subjects nor of those observers who had inspected them, just as these two groups didn't agree with each other.

The only possible conclusion is that a peculiarly shaped head, an odd ear, close-set eyes, a hooked nose, wide mouth, receding chin, or any other unusual feature about your head has nothing to do with whether you are intelligent or dumb, honest or a criminal, or whether you would be a success in one line of work but not in another.

Mind tests, however, do offer certain assistance in solving some angles of character, and particularly in picking the right man for the right job, where a great number of men are to be employed for the same kind of work. If an employer wants a great many men to do exactly the same things it is possible to study those already employed, discover what makes some better workmen than others, and then devise tests for future employes to determine whether they have the qualifications of the good men already employed or whether they will fall into the class of the inefficient.

We have developed tests to measure a person's mental alertness and capacity for handling ideas. We also have some excellent tests for measuring mechanical ability, the ability, for instance, which a telephone operator needs to push plugs into phone jacks. Partial tests have been developed to measure the ability of one individual to get along with another, but these have not yet reached beyond the experimental stage.

Take any business convention and look over the men or women in attendance. They are successes in their particular line, or they wouldn't be at a national gathering of its leaders. Yet in a convention of a thousand or so business leaders in any particular industry you may find every possible type of nose, all the possible variations in head shapes, ears with small lobes and large, detached lobes and attached lobes, ears that cling to the head and stick out; eyes of every color, shape and position in the head.

The professional character analyst would have no trouble classifying any one of these men as a success, but neither would you. Meet one of them, talk to him a few moments, and his clothes, his bearing, his air of success, well-being, and his apparent accustomedness to authority would tell you just what the character analyst learns from the same things—that here is a successful man.

While it is true that habits leave their marks, so that the studious become round-shouldered, the cheerful have smooth countenances, and the guilty show furtive eye movements, yet it is not true that stooped shoulders are a universal sign of scholarly interests, nor are dimples always a sign of guilelessness. We are positive, too, that a high brow is not necessarily a sign of learning, or a shifting eye that of a thief.

Typical Feminine and Masculine Heads, Left and Right, Showing Reversal of Triangles, and, Center, the Round Head Which Is Said to Denote the Highest Type of Intelligence

What Does the Shape of a Nose Mean? Character Readers Claim the First Three Types above All Belong to Optimistic People, the Fourth to a Pessimist and That the Owner of the Fifth Is Inquisitive, Always Anxious to Acquire Knowledge; Arched Noses, They Assert, Are Mainly Masculine and Are Accompanied by a Commanding Voice and Considerable Temper, While Concave Noses Are a Feminine Type, Usually Accompanied by Meekness and a Soft Voice; Men with Roman Noses Lack Patience

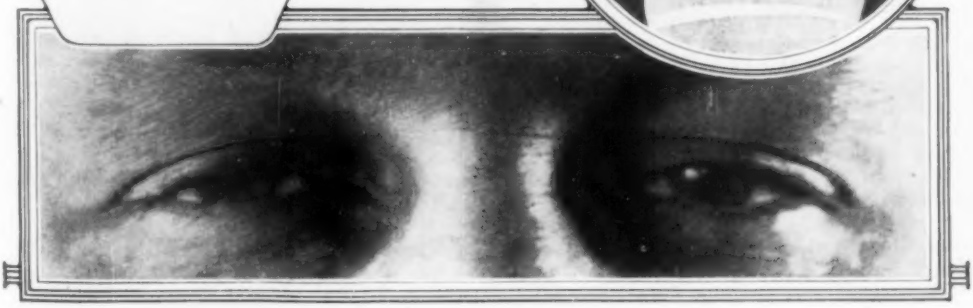
Concave Nose on a Man, as at Left, Is Said to Indicate Lack of Executive Ability, the Full Lips Show Self-Indulgence and Receding Chin Lack of Determination

A Bump above the Eyes, as Above, Shows, It Is Claimed, Powers of Observation, the Roman Nose May Mean Executive Ability, While the Firm Lips and Straight Chin Are Credited with Being the Outward Symbols of Considerable Determination

Some Ears Have Detached Lobes and Others, Like the One at the Right, Do Not; This Type, the Feature Experts Say, Indicates the Wearer Is of a Lawless, Not to Say Criminal, Type, While Broad Ears May Imply Sensitiveness, Timidity and Love of Music

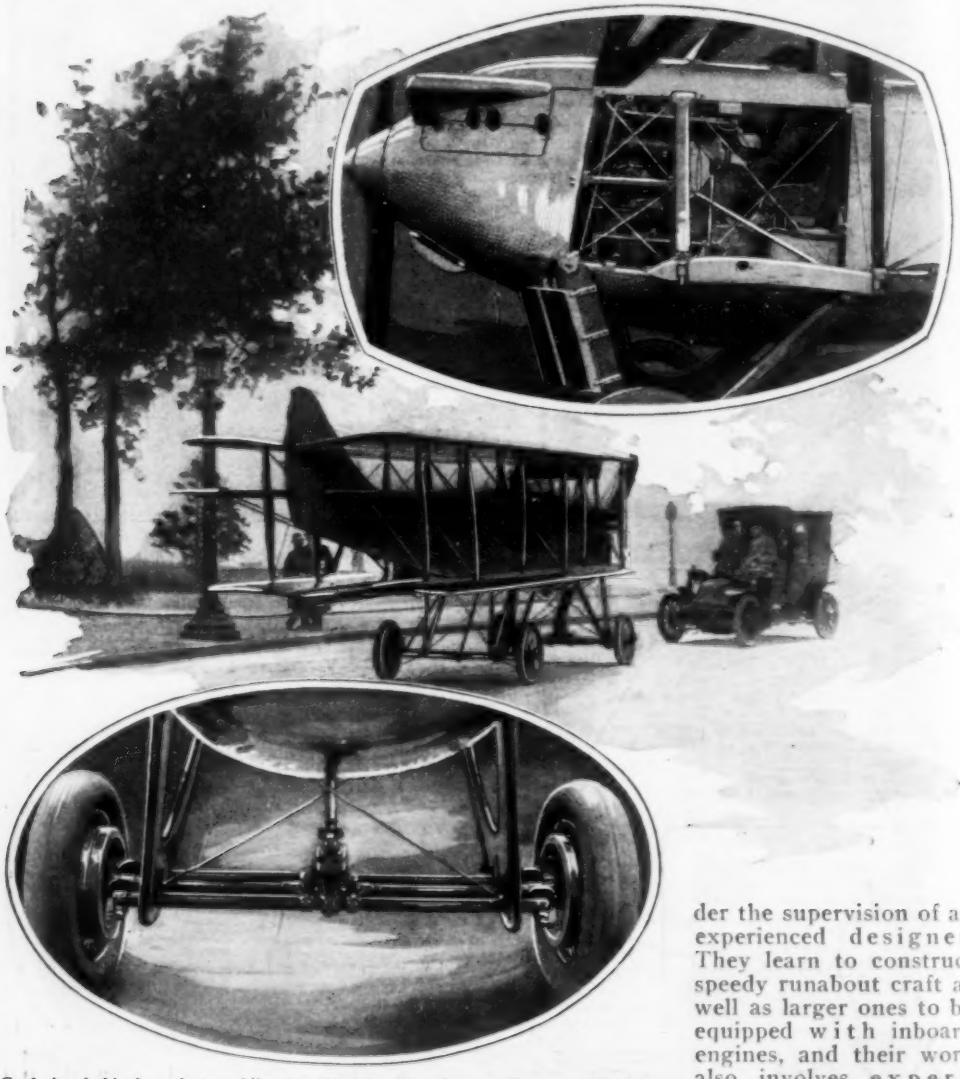
Eyes, the Lids of Which Are Ordinarily Two-Thirds Closed Are Said to Indicate Deep Thought, Curiosity, Skepticism, Suspicion, Shrewdness, Caution, Severity and a Host of Other Things, While Their Owner May Be Selfish, Grasping or Penurious

Narrow Heads Are Supposed to Show Greater Aggressiveness and Intelligence than Round Ones



AUTO OF THE CLOUDS ALSO ABLE TO TRAVEL ON ROADS

Capable of flying in the air or running on the ground, an airplane-automobile recently was demonstrated in France. It



Cockpit of Airplane-Automobile, the Machine Running on Street as Vehicle, and Close View of Front Driving Wheels and Axle

differs from ordinary planes because it has folding wings and four wheels. A propeller shaft runs from the fuselage to a transmission which turns the rubber-tired front wheels with their brakes and steering mechanism. The power to drive the plane on land is furnished by a small auxiliary engine. Its conversion into an "auto" takes less than half an hour.

BOYS TAUGHT TO BUILD BOATS AS PART OF SCHOOL WORK

Part of the regular class work of boys attending a school in Rhode Island is the interesting task of building real boats under the supervision of an experienced designer. They learn to construct speedy runabout craft as well as larger ones to be equipped with inboard engines, and their work also involves experiments with marine, automobile and aviation motors. Besides affording training in the use of tools and in acquiring skill with the hands, the boat-building fosters a love of outdoor sports and healthful living, the instructors have found.

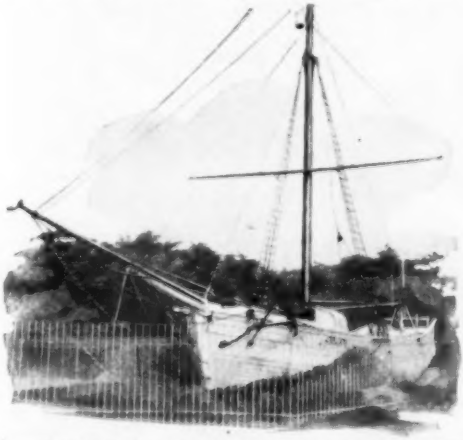
¶ Rural mail carriers in the United States, it has been estimated, travel, on an average, 1,173,473 miles daily.

SOLVE MYSTERY IN LANGUAGE OF THE HONEY BEES

That bees have a language by means of which they can communicate with one another about new-found feeding grounds, the kind of flowers to visit and their general direction from the hive, appears to be proved through experiments made by a German scientist. He found a swarm of bees would visit the place where sugar was exposed immediately after one of them had fed and returned to the hive to spread the news. This the bee does by a peculiar dance. By marking bees with colors and feeding some while leaving others unfed, the experimenter proved that only those which had been fed would start the dance that brought swarms to new feeding grounds.

VESSEL SAILED BY AMUNDSEN IS EXHIBITED IN PARK

Protected by an iron fence and "anchored" high on dry land, the little sailing vessel "Gjoa," used by Capt. Roald Amundsen in locating the magnetic north pole, is one of the sights of Golden Gate park, San Francisco. In this tiny ship, the explorer and a crew of six men successfully negotiated the northwest passage in the summer of 1905, after spending several months in taking observations in the polar regions, arriving in San Francisco in the fall of the following year. Capt. Amundsen presented the ship to the city in 1909. It is preserved almost in-



Amundsen's Sailing Vessel "Gjoa" at Anchor in Golden Gate Park, San Francisco

tact as he used it, and is kept painted and repaired to insure its lasting for many years to come.

Corner View of Sidewalk Show Windows Used While Store Interior Was Being Remodeled

SHOW WINDOWS ON SIDEWALK SERVE DURING REMODELING

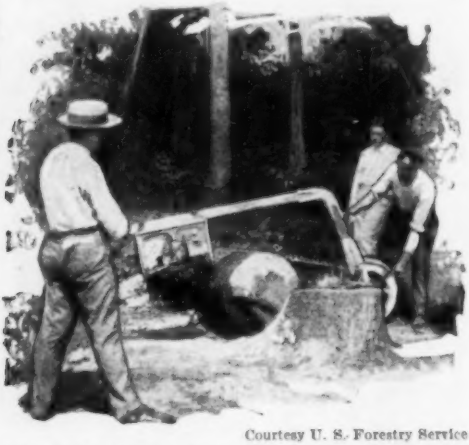
Business not only was carried on as usual during alterations in a Chicago store, but there was practically no loss from lack of show-window space, as temporary booths were erected on the sidewalk and goods displayed in them in the regular manner. Decorated outer panels and painted frames for the glass gave the exterior an attractive appearance.

SMALL BELLS IMITATE CHIMES IN RADIO BROADCASTING

In the studio which broadcasts the chimes in the Metropolitan Life Insurance building in New York, a set of small bells has been built to reproduce the tones of the large ones and put them on the air. The real chimes are placed far apart and the distortion caused by the great volume of sound makes it practically impossible to send out the original notes. The small bells are connected to the timing device controlling the large ones in the tower, and the effect to the radio listener is said to be the same as to the passers-by in the downtown section of the city.

CHAIN SAW DRIVEN BY MOTOR CUTS LOGS AND TREES

Operated by a small gasoline motor, a portable saw with its teeth in the form of a chain, is suited to work in dense woods and difficult places, saves considerable hand labor and may easily be adjusted for felling trees or cutting logs into segments. Engine and mechanism are supported on an angular framework that may be placed quickly in a vertical or horizontal position for various operations.

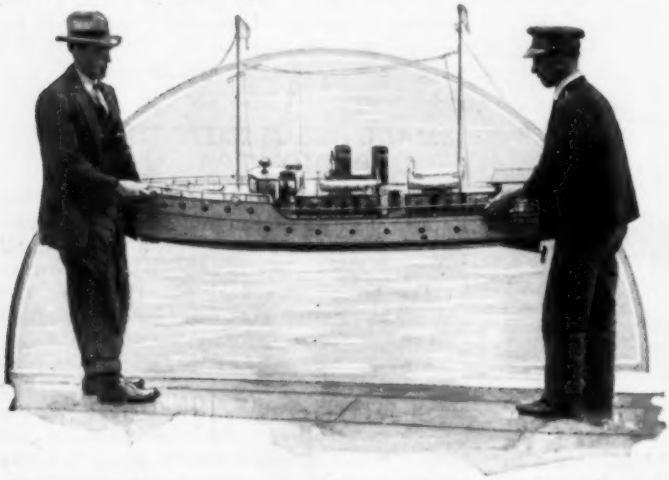


Courtesy U. S. Forestry Service

After Felling Tree, Chain Saw Is Used to Cut the Log into Sections

MODEL MARVEL YACHT DRIVEN BY DRY BATTERIES

Radio, electric lights and other articles of modern equipment have been fitted to a model yacht, forty inches long, an eastern man has constructed. The boat is run by a small propeller, actuated by current from dry batteries stored beneath the deck. The builder estimates that $1,500 was spent on the model.



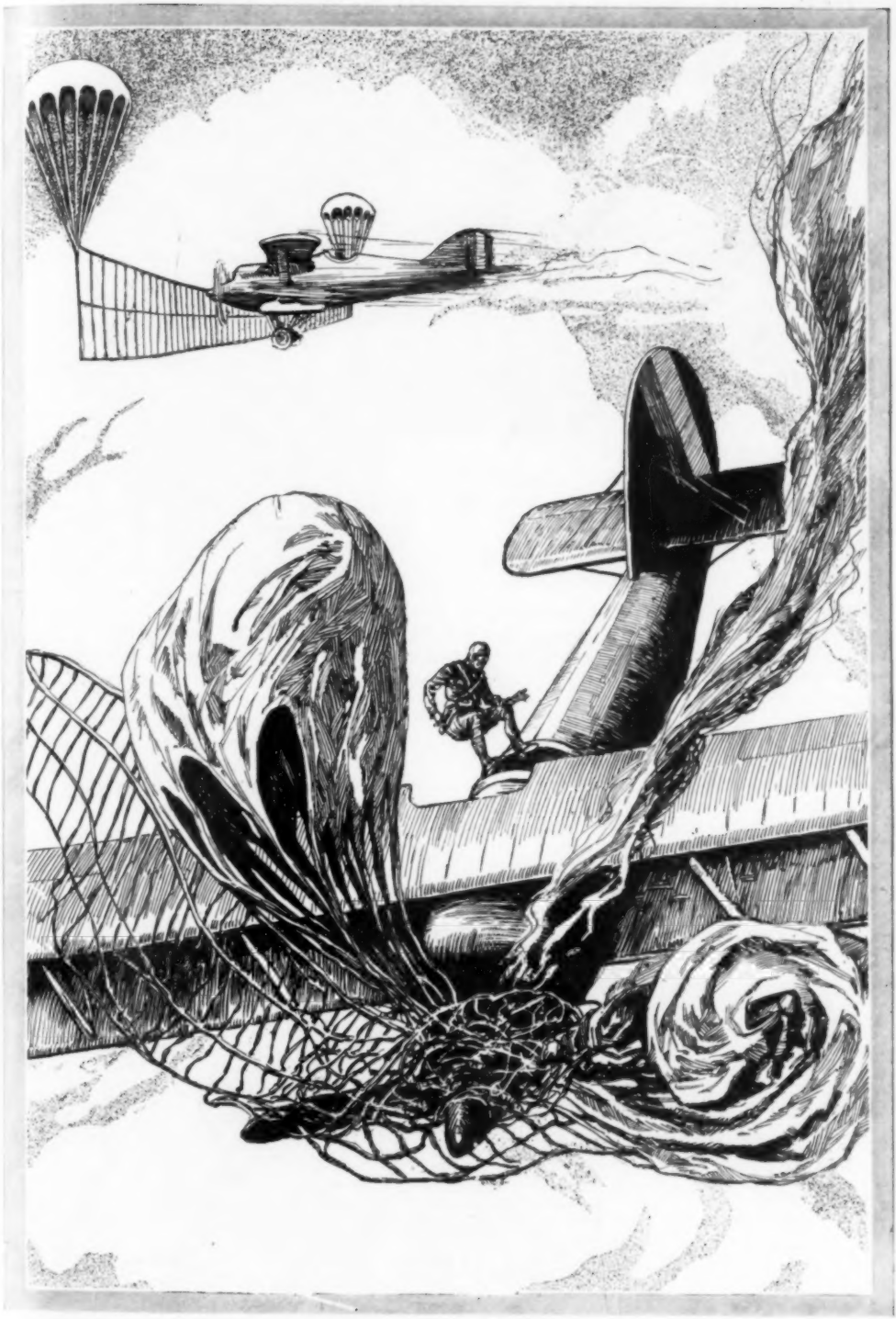
Realistic Model Yacht That Cost $1,500, Ready for Launching; Batteries That Drive the Tiny Propeller Are Concealed Inside

NETS LAUNCHED ON ROCKETS TO SNARE AIRPLANES

Nets fastened between parachutes and shot high into the air with shells or rockets are being tested by anti-aircraft branches of the Japanese army and navy as snares for airplanes. They are intended to drift into the path of the ships, entangle the propeller and necessitate a forced landing.

SHOPS COMBINE AS COMMUNITY TO TRAIN APPRENTICES

Metal-working shops in Milwaukee, have devised a community or district plan whereby apprentices are trained and developed to fit them as all-around mechanics. It is a co-operative system, enabling the small shop to contribute its share to the work, yet affording the apprentice the benefit of instruction available only in the larger places, and insures manufacturers a supply of skilled men. Some of the smaller factories can give no more than six months' training, but the boys are allotted in such a way that they do not get duplicate instruction. Their course is completed in the big shops. In most cases, there is a clause in the contract that specifies exactly what training the boy will receive in the various places to which he is to be sent, and it also covers the number of hours he will spend on each subject and the wages he will receive. In serving their apprenticeships the boys must also attend the city's vocational school five hours each week, regardless of age. It has been found that, wherever good apprentice courses were offered, there were more applicants than could be handled. The educational advantages of the plan are emphasized, and a $100 bonus is paid the four-year apprentices at the end of the course.



Artist's Drawing of Airplane Snares in Operation; as Ship Flies into Mesh Which Has Been Launched by Rockets and Is Floating from Parachutes, the Propeller Is Fouled

Pointing to Light on Air-Hose Meter; It Goes Out When Tire Is Properly Inflated

AIR METER ON HOSE IS SET AT EXACT TIRE PRESSURE

For the convenience of motorists and attendants at auto-service stations, an air hose with meter and light attachments simplifies the task of inflating tires. Near the top of the stand, is a clocklike indicator which is set at the pressure desired. This lights a lamp below. The hose is connected, the air turned on, and as soon as the required pressure is reached, the light goes out as a signal to shut off the supply. This eliminates the bother of using a hand gauge, is said to be accurate and well adapted to use with balloon tires.

GLASSES WITH BLUE LENSES SHOW NATURAL COLORS

Store customers can see the natural color of goods they wish to buy without going to the light or employing special lamps, by using a kind of spectacles a Vienna doctor has devised. The glasses have blue lenses which absorb some of the yellow rays present in the ordinary incandescent lamp so that a person looking through them, under artificial illumination, sees colors as they appear in daylight. The spectacles already are being used in the laboratories of the paper, textile and dye industries where color solutions must be judged accurately.

CORRUGATED SIDES OF SHIPS TO PREVENT ROLLING

Ships with hulls having under-water bulges extending from bow to stern now travel between New York and Liverpool. It is stated that the submerged corrugations do away with much pitching and rolling by leveling ground swells and wave eddies created by the ship's motion through the water. Another effect of the bulges is that they enable the propellers to turn in a full body of water, which increases their driving power and the speed of the vessel.

Bulges on Sides of This Steamer, Which Has Just Been Launched, Are Designed to Decrease Boat's Rolling and Pitching Motion in Heavy Seas, and Add Speed

Courtesy General Electric Co.

Niagara as It Appears under Colored Floodlights and Battery of Lamps That Furnish the Splendor

NIAGARA FALLS ILLUMINATED BY BILLION CANDLEPOWER

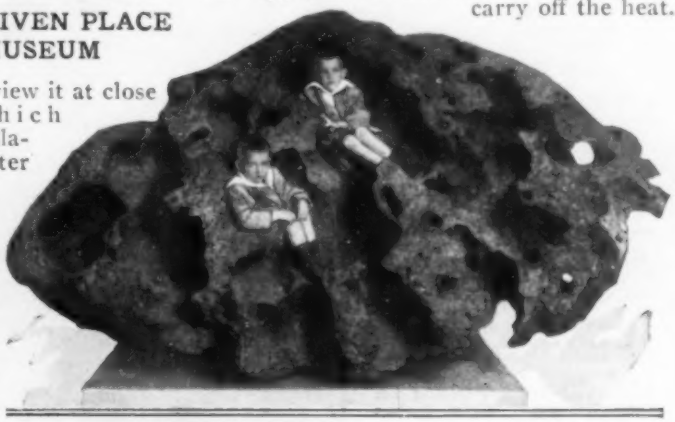
Spectacular color-lighting effects, obtained from twenty-four powerful searchlights throwing one and a third billion candlepower on Niagara Falls, were shown at the recent opening of the illumination system by which the waters are to be brightened every night. While white light is to be used ordinarily, there will be color drills with purple, lavender, green, yellow, pink and crimson screens on special occasions, with a man operating each unit. The lamps are mounted on the balcony of a tank on the Canadian side of the river; they are of a new thirty-six-inch type, with motor-driven ventilators to carry off the heat.

DOG PLACES SIGNAL LANTERNS TO GUIDE BOATMEN

Steamboat men along the Ohio river have become attached to "Old Shep," a dog belonging to one of the government light tenders at Silver Grove, Ky. Each evening during navigation seasons, the dog, accompanied by its master, appears on the river bank, and taking the lanterns one by one in its mouth, places them in their proper position at the ends of the dikes, saving the keeper many steps.

GIANT METEORITE GIVEN PLACE OF HONOR IN MUSEUM

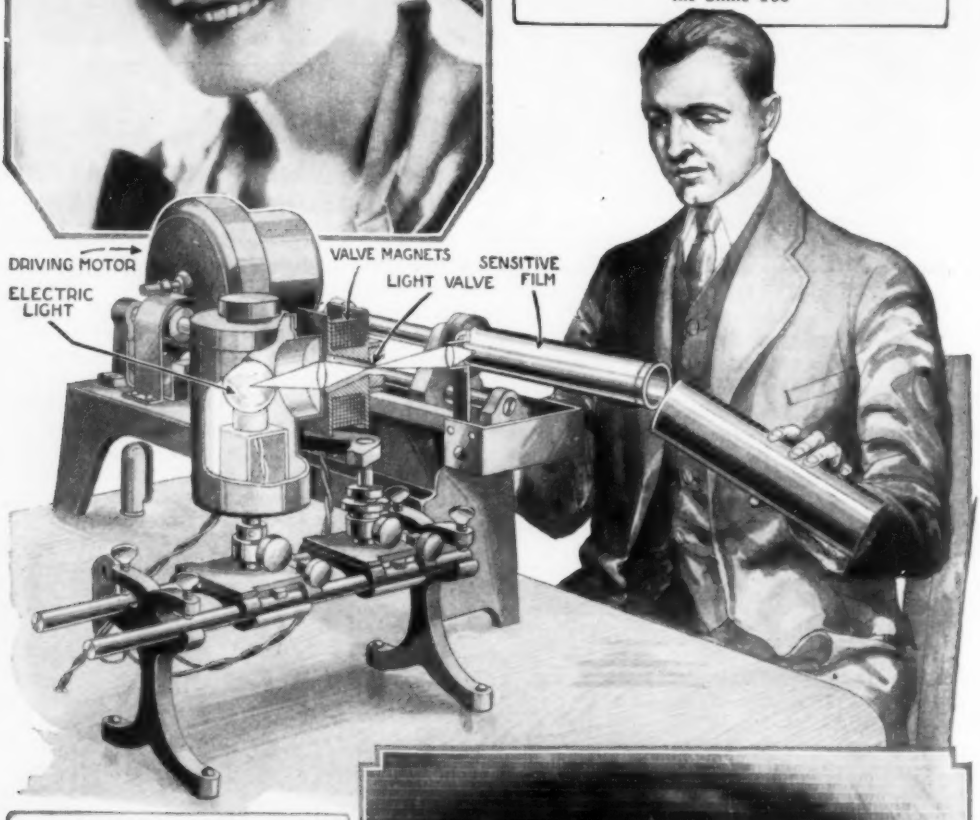
So that the public may view it at close range, the meteorite which fell from the sky at Willamette, Oreg., and was later dug out of the ground, has been placed on a pedestal in the American Museum of Natural History, New York. By polishing and etching a section of the rock with acids, scientists find peculiar lines and figures from which the nature of the metals composing the meteorite may be learned.



Courtesy American Museum of Natural History

After Its Blazing Trip through Space, Giant Meteorite Mounted in Museum Almost Hides Two Boys in Its Rugged Cavities

Telephoto Pictures, Left and Above, after Transmission across Continent; It Used to Be "The Voice with a Smile;" Now They Send the Smile Too



Receiving Equipment of the Telephone-Picture System, Showing Operator Uncovering the Sensitive Film on Which the Transmitted Picture Will Be Photographed; the Signals from the Sending End Operate the Light Valve and Control the Amount of Light Reaching the Revolving Film; Right, Picture of the Left Eye of the Woman at Top of Page, Enlarged

Left, Unretouched Copy of an Original Picture; Center, the Negative Print of the Positive Film Transmitted, and, Right, the Telephoto Picture as Received

Pictures by Long-Distance Telephone

How the System That Transmits Photographs over Same Wires by Which You Talk, Cuts Four Days to Seven Minutes

WHEN you pick up the receiver to answer a long-distance telephone call, the telephone company only rents you a fractional part of the pair of wires which you and the person at the other end appear to have all to yourselves. In fact, there may be other pairs of people talking over the same two wires, or ten or twelve telegraph circuits working them too. Within the last few months the long-distance user who put in a call for any of the points between New York, Chicago and San Francisco was not only sharing his pair of wires with other correspondents, but chances are that while he talked, a picture went flitting over the same lines, bound from coast to coast, or to the way station at Chicago. Telephoned pictures are made possible by two remarkable inventions, an alkaline metal in a vacuum in a glass tube which causes the tube to become a conductor of electricity when exposed to light, known as a photoelectric cell, and a light valve, which works as an electric camera shutter.

When you speak into the telephone the sound waves set the metal diaphragm vibrating, and its vibrations control an electrical current, sending out streams of electrical impulses over the wire, each impulse having a strength proportional to the displacement of the diaphragm caused by your voice. At the other end of the wire the impulses magnetize and demagnetize the diaphragm of the receiver and set it to vibrating in tune with that at the transmitting end, converting electrical energy back into sound.

The photoelectric cell does the same thing with light at the transmitting end as the telephone diaphragm does with sound, and the light valve picks up the fluctuating electrical impulses at the receiving end and translates them back into corresponding light pulsations. The photoelectric cell is inclosed in a black metal tube, an inch or so in diameter and some ten inches long, with an aperture half an inch in diameter near one end. Inside, down through the center, runs a glass tube terminating in a small bulb behind the aperture. Two electrodes, one of which is made of potassium, a metal which is extremely sensitive to light, complete the cell. As a light plays on the potassium electrode, the cell becomes a good electrical conductor in exact proportion to the strength of the light.

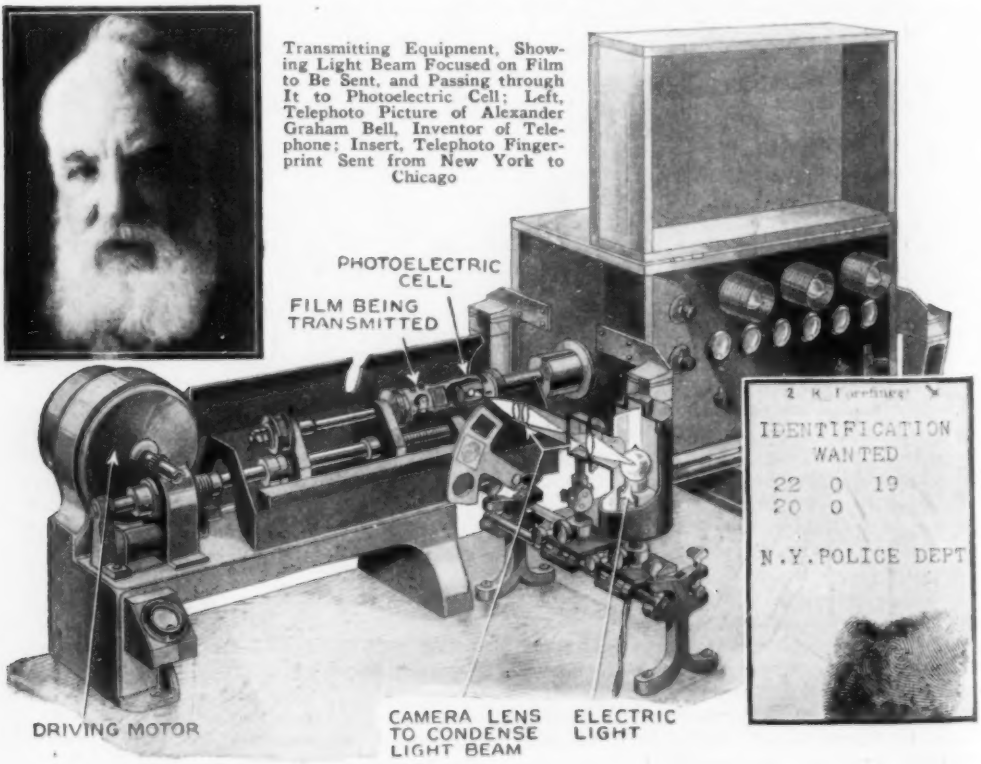
The light valve consists of a narrow slit, in which is suspended a tiny wire, with a system of magnets and coils by which it can be vibrated. As the wire vibrates it

uncovers more or less of the narrow slit and so permits light to pass through, and the greater the vibration the more light gets past, since the opening is wider. As the vibration is set up by the strength of the current received from the sending apparatus, the amount of light passed corresponds to the amount of light which originally was played on the photoelectric cell, and there converted into electrical impulses that cause the light valve to vibrate.

The film to be sent is not the original camera negative of the picture, but instead a positive film, made by printing the original negative on film instead of paper. Inside the rolled cylinder of the transmitting film is the photoelectric cell, so that the beam of light passing through the film strikes it, the amount of light getting through depending upon the darkness or lightness of the particular spot on which the light is striking. As the machine is started, the cylinder of film begins revolving at about 100 revolutions a minute, while it is fed forward, at right angles to the light beam, by a long screw with a fine-pitch thread of 100 to the inch. With the cylinder revolving 100 times a minute, and moving forward one inch for every hundred revolutions, it takes just seven minutes to transmit one of the five by seven-inch films used.

From the photoelectric cell the electrical impulses, set up by the light waves passing through the film, are transmitted by an apparatus similar to a radio-broadcasting set, except that the current is sent over wires instead of through the air. The same wires which carry the picture impulses are carrying another current from the driving apparatus that turns the film on the sending machine, and these impulses control the receiving motor, thus maintaining the same speed.

The receiving apparatus is almost like the sending set, except that the light valve replaces the diaphragm between the two condensing lenses. The pictures received are so perfect that it is hard to detect, without a microscope, that they are not actual prints from the original negative. In one picture transmitted from New York to Chicago and San Francisco, showing a vista through two rooms of a home, every detail of paintings on the walls, photographs standing on the bookcases, and even the intricate design of a lace table scarf stands out as clearly as in a fine photograph.



Transmitting Equipment, Showing Light Beam Focused on Film to Be Sent, and Passing through It to Photoelectric Cell; Left, Telephoto Picture of Alexander Graham Bell, Inventor of Telephone; Insert, Telephoto Fingerprint Sent from New York to Chicago

WINGS OF METAL AIRPLANE SUPPORT SIXTY-ONE MEN

Strength and size of an all-metal German monoplane were demonstrated when

Sixty-One Men on Metal Monoplane's Wing Convincingly Demonstrated the Strength of the Huge Three-Engine Flyer Shortly After It Was Completed for Service in Germany

sixty-one men stood side by side across the wing without injuring the machine in any way. The test indicated the superior rigidity of metal construction over wood and canvas, and showed what great stresses the plane can withstand safely while in motion. An additional advantage of metal wings is that they do not absorb moisture so that their weight, although greater than that of fabric, remains more nearly constant, and sudden drying or wetting does not injure them.

DUST OF THE AIR TO BE MADE USEFUL TO INDUSTRY

Predictions that the dust that settles from a cloud of coal smoke can be used for practical purposes in industry either as filler for paint or for an ingredient in building material have been made by Prof. A. G. Christie, of the Johns Hopkins university. The use of pulverized fuel with attendant loss in volume because of the amount of unconsumed coal carried up the stack, points to a way for considerable saving, he believes, for if this could be recovered as dust, it could be burned again.

SAP HAS HIGH PRESSURE

That the pressure of outflowing sap in wounded trees during summer may be as high as 150 pounds per square inch, or equal to the steam pressure in a locomotive boiler, is claimed by Dr. D. T. McDougal, of the Carnegie institute, who discovered the fact through the use of special instruments placed in tree trunks. The experiments also showed that during spring sap rises even in trees with dead roots, trunks and leaves, which is said to show the process is purely mechanical.

MOTORCYCLE WITH FRONT CAR CARRIES TWO PASSENGERS

Motorcycles with a car for two passengers in front instead of at the side, have appeared in Berlin and are said to afford an economical, rapid and comfortable means of transportation that is well adapted to crowded streets. The driver sits behind and steers by means of a lever bar. The wheel arrangement is that of a reversed tricycle with two before and one at the rear. A four-horsepower motor, headlights at the sides of the car, a windshield and a door on the right, are features of the equipment.

Copyright, Keystone View Co.

Two-Passenger Motorcycle with Car in Front for Quick Travel in Crowded City Streets at Little Cost

MEDICINE SAFELY GIVEN DOG BY TYING JAWS WITH ROPE

A safe way to give medicine to a dog has been demonstrated by a New York veterinarian. He twists a piece of soft, strong rope in a half-hitch around the animal's jaws and ties it about the neck at the top of the head. The lower lip is pulled down to form a pouch and the medicine poured into it from a spoon or dropper. It trickles into the dog's mouth and he is forced to swallow it.

Dog's Jaws Are Tied for Safety and Medicine Is Being Given by Pouring It between Lips

SIZE OF RAINDROPS RECORDED FOR SCIENTIFIC STUDY

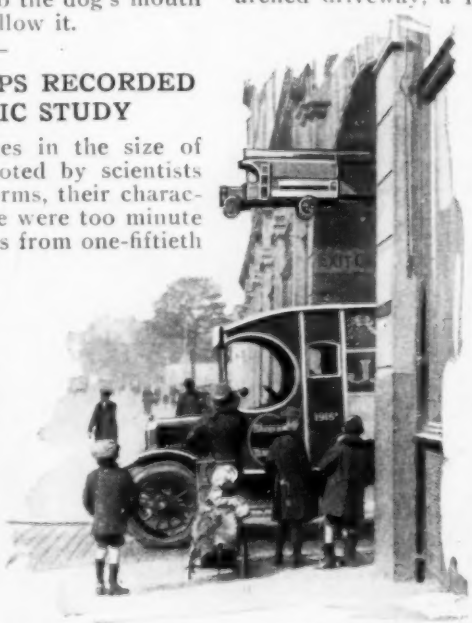
Remarkable differences in the size of raindrops have been noted by scientists during the study of storms, their character and duration. Some were too minute to be recorded but drops from one-fiftieth to one-third of an inch in diameter have been registered, often many different sizes being found in the same rainfall. Two general methods are employed in measuring them. One is to let them fall on a piece of blotting paper coated with a dye so the area can be observed more accurately. The other way is to let the drops fall into a shallow receptacle containing a fine powder or flour. As they plunge into the dust, they form little pellets or casts of dough. These correspond closely to the actual size of the drops. The casts are placed on a dark surface and photographed, and are then filed together with data as to the kind of storm, the nature and height of the clouds, whether there was lightning, and other facts relating to the occasion when they were gathered.

ELECTRIC PUMPS MAKE FARMS OF FLOODED ACRES

More than 100,000 acres of swamp land in the central part of Illinois are being converted into fertile farm soil through the use of electric pumps. When the completion of the Chicago drainage canal raised the level of the Illinois river several feet, great stretches along the river front, which otherwise might produce crops, were flooded. While steam-operated pumping stations were built to carry the waters to a central point, they were widely separated and the difficulty of supplying them with fuel led to the use of electricity.

TOY AUTO SERVES AS WARNING TO PREVENT COLLISIONS

Sounding a horn and running overhead ahead of trucks emerging from an arched driveway, a miniature pilot automobile is used by an English firm to prevent traffic accidents. The pilot runs on a rail under the roof of the passage and is set in motion when a truck passes over a strip set into the pavement. Arrived at the end of the track, the pilot automatically returns to the starting point, ready to repeat the operation; at night it carries two lights.



Courtesy L. Lyons & Co., Ltd.

Little Pilot Auto on Overhead Track Rolls Out as Cars Emerge from Passageway

¶Charcoal with the heating value of anthracite is said to be produced in Austria, wood, shavings and waste being used in the process.

ARTIFICIAL SUNS TAN BATHERS ON LINER

Tanning Light in Use Showing the Steamer Pool and Close View of Front of Lamp

Bathers in the swimming pool of a large ocean liner may acquire a coat of tan in spite of the fact that they are not exposed to the sun. A lamp that projects a special kind of ray is set up near the water, and after a person has sat under it for a short time, his skin is given a healthful brown similar to that produced by the sun. The desired depth of color can be obtained with little difficulty, and the swimmer is spared the discomfort that often accompanies tanning in the usual way. The lamp can be moved about easily, is simple to operate and a broad lens of a special glass diffuses the rays to insure safety and uniform coloring.

Erecting Thigh Bones of Ninety-Foot Dinosaur in Field Museum of Natural History

TWENTY-FIVE TON MONSTER'S BONES PUT IN MUSEUM

A mental picture of monsters, weighing twenty-five tons each, which roamed the world millions of years ago, was conjured up at Field museum when the work of reconstructing and assembling fossils brought from South America was begun recently. Steel pulleys and chains were necessary to haul into upright position two thigh bones of dinosaurs, one of which is six feet seven inches long and weighs 930 pounds.

MOVIES FOR SHIP PASSENGERS TO CURE SEASICKNESS

Seasickness is believed to be due partly to strain on the eyes caused by the constantly shifting planes of the ship. To counteract the effects of this movement and thus possibly spare passengers unpleasant illness, experiments are under way in filming special motion pictures for exhibition on liners. They are expected to have a soothing effect on the eyes and enable persons to regain a complete sense of balance. As many ships are already provided with equipment for displaying the reels, no additional expense will be involved, and the pictures themselves will afford another source of entertainment on long voyages.

NEW YORK'S UPWARD GROWTH IS SHOWN IN PICTURE

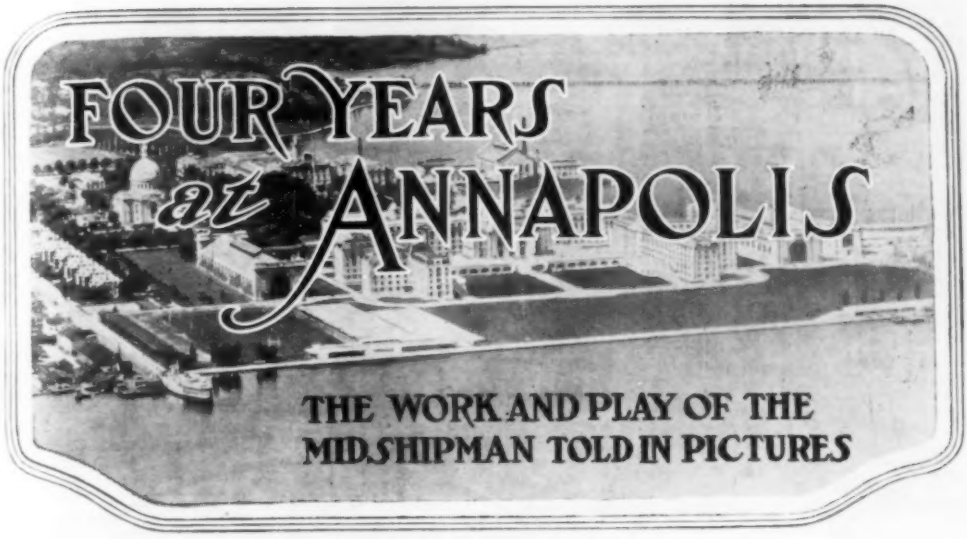
How skyscrapers have pushed steadily upward has been shown in a panoramic sketch of the buildings erected by one company in the last twenty-five years. The picture was exhibited at the convention of the American institute of architects. Most of the structures were represented as massed in a towering pile at one side of the drawing, while the latest tendency in architecture, the "stepped-in" style of building, was outlined at the other, leaving the center for more modest walls to form a contrast. The display emphasized the dominant note of utility that characterizes the modern structure.

PORTABLE TENT LIKE A DRESS FITS OVER BATHER'S HEAD

As a valuable accessory for picnickers, a portable tent has been designed of attractive cretonne cloth. It fits over the head like a garment and envelopes the whole body so that a change to a bathing suit can be made anywhere in privacy.

Figured Tent for Changing Bathing Costume Folds into Small Package When Not in Use

When not in use, the tent folds into a convenient bundle.



I—The First Year

MORE than 500 boys, between the ages of sixteen and twenty years, entered the naval academy at Annapolis last month as midshipmen, to undergo a four-year course of training to fit them for officers in the navy. Practically every congressional district was represented, as each congressman and senator may appoint a candidate. In addition the president sent fifteen boys, nominated from the country at large, and the secretary of the navy picked 100 candidates from the enlisted ranks of the navy and twenty-five from the naval reserves.

The new midshipmen each year reach the academy on the heels of the departing graduating class. The other three classes have sailed away on their summer cruise and, until the first of October, the "plebes" have the academy to themselves. Life the first summer is no "bed of roses" for the raw recruit. He learns to turn out when reveille blows at 6:15 in the morning, and finds every minute of his day regulated until taps sounds at 10 p.m. and the inspection officer turns out the last lights. He learns to stand and walk properly, to wear a uniform and keep it neat, to march in squads and battalions, learns the manual of arms and simple infantry drills. He also learns that of the $780 a year Uncle Sam pays him, he may only draw three dollars a month for pocket money. When the three upper classes have completed their cruise, taken the month-of-September leave, and returned to the academy, the rawness has been polished off the new plebe but then a new course of training starts.

The academic year gets under way with the return of the upper classes in October. The new middies are permitted to make a choice between French and Spanish for the four-year course of study. That is the only elective subject. Mathematics, English, physics, chemistry, electrical engineering, hygiene, seamanship, executive, ordnance and gunnery, navigation and marine engineering and naval construction are all required.

Construction details of airplane engines and of planes have been taught in the school of engineering for several years, but, beginning this fall, the course will be made a major subject, with ground and flight tactics added.

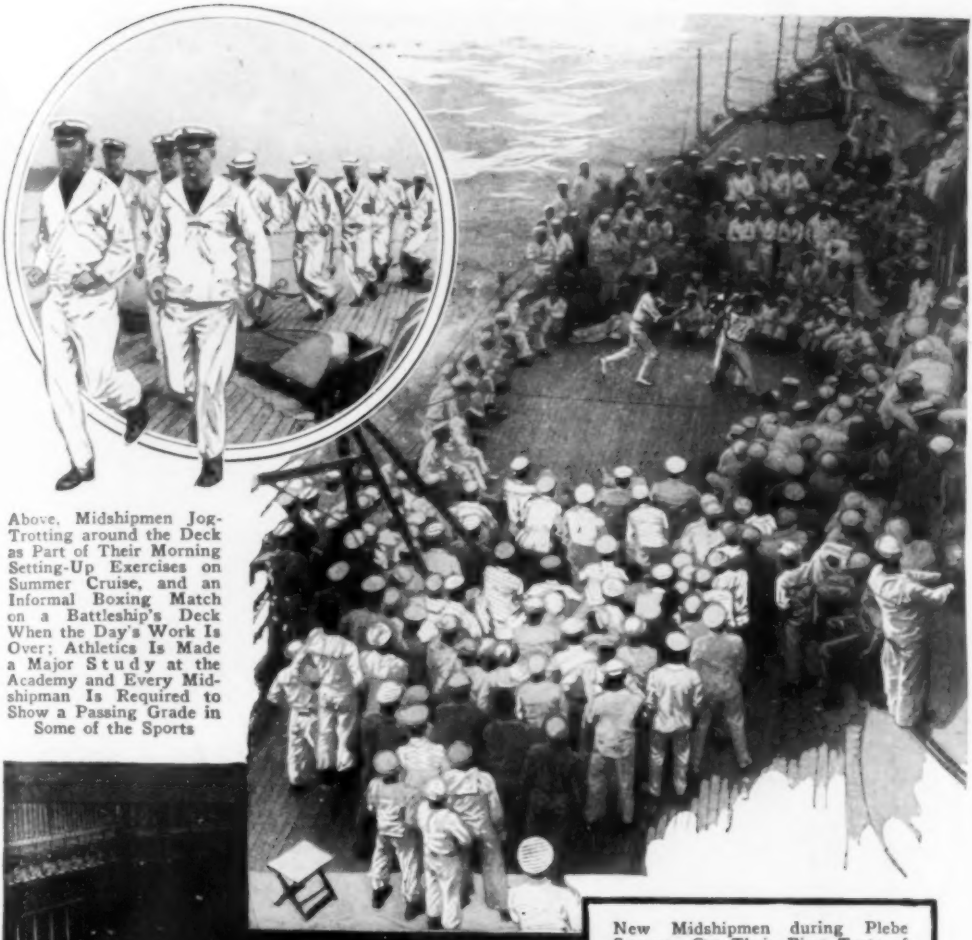
Classes continue from 7:50 a.m. to 3:30 p.m., followed by an hour of drills on week days, and from 7:50 to noon on Saturday. The only break in the routine is the omission of Wednesday drills in favor of sports. Evenings from 7:45 to 9:30 must be spent in study, and tattoo at 9:55 orders the midshipmen to bed.

Graduation day is almost as great an event for the plebes as for the upper classmen who pass out as ensigns, with their coveted diplomas. As soon as the first class has ceased to be, and the fourth-class men have automatically moved up a notch into their "youngster year," or third class, a wild snake dance starts across the broad lawns of the yard, the dancers chanting a navy classic entitled "There Ain't No Plebes." Next month the life of a third-class man will be described.

Every Article in a Midshipman's Locker Must Be Folded According to Regulations and Occupy Its Proper Space, or Trouble Will Ensue When the Daily Inspections Are Made; Top, Right, the Future Admirals Sweep Their Own Rooms

Making His Bed Is One of the First Things the Plebe Learns; Like Everything Else He Will Do for the Next Four Years, the Method Is Carefully Laid Down in the Book of Naval Academy Regulations

Failing to Turn Out at Reveille, or Going Back for a "Cat" Nap after Turning Out Is a Crime That Draws Eight Demerits, in Addition to Four Hours of Confinement or Four Hours of "Exercise," Walking a Prescribed Beat



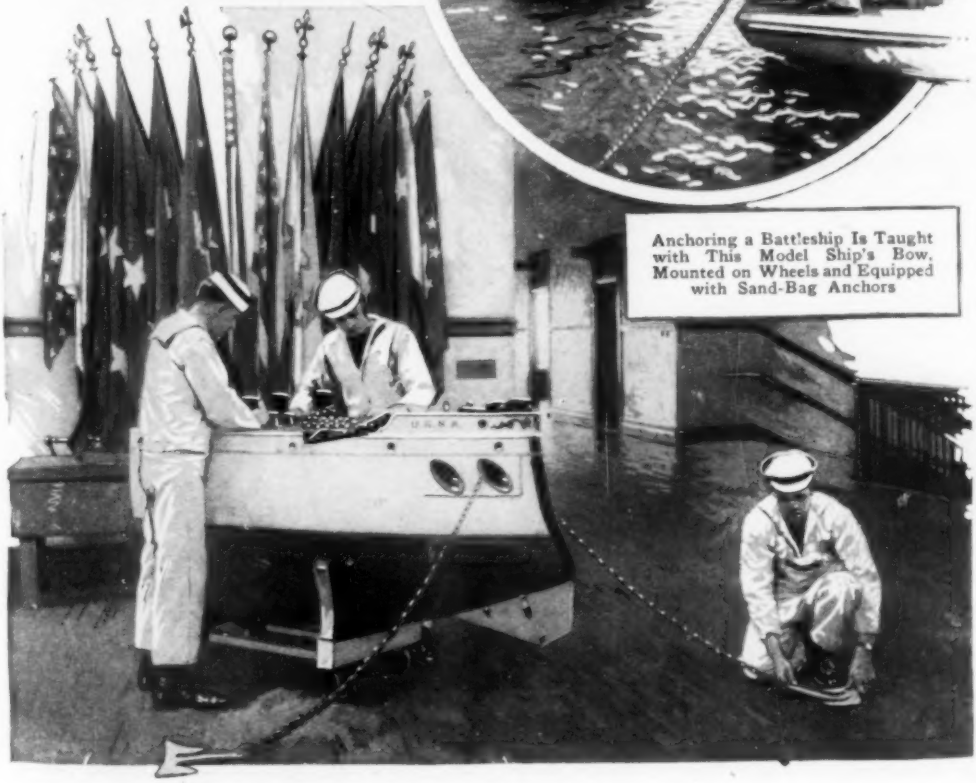
Above, Midshipmen Jog-Trotting around the Deck as Part of Their Morning Setting-Up Exercises on Summer Cruise, and an Informal Boxing Match on a Battleship's Deck When the Day's Work Is Over; Athletics Is Made a Major Study at the Academy and Every Midshipman Is Required to Show a Passing Grade in Some of the Sports

New Midshipmen during Plebe Summer Get Their First Taste of Long Hours of Muscle-Building Exercises, Designed to Give Them Grace and Carriage for Mass Drills

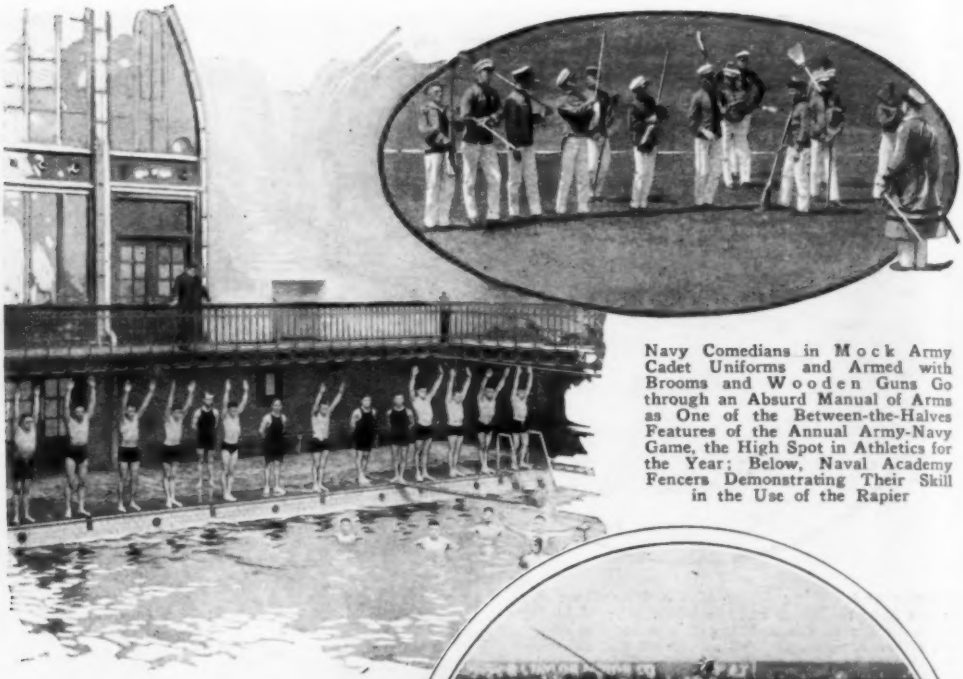
Caught with a Torn Shirt in His Locker at Inspection, This Midshipman Is Due for a Few More Demerits on His Record; Left, a "Savvy Plebe" Who Knows His Lesson and Writes All over the Board While His Classmates Sit Back and Watch the Future Honor Man

The New Plebe, Above, Begins Moving a Portion of His Equipment to the Room Assigned to Him in Bancroft Hall; Everything That Goes into the Room Is Prescribed and Must Conform to Regulations; the Next Job, Left, Is to Prepare a Name Stencil and Stamp His Laundry with This Man's-Size Mark

Frigates and Sailing Ships of the Line Have Passed from the Seas, But the Sailor Must Still Learn to Tie Knots and Rig Slings for Casks and Other Articles, as Well as Master the Sailing of Sturdy Little Catboats with Which the Academy Teaches the Theory of Sailing; at Right, One of the Sailing Fleet



Anchoring a Battleship Is Taught with This Model Ship's Bow, Mounted on Wheels and Equipped with Sand-Bag Anchors



Navy Comedians in Mock Army Cadet Uniforms and Armed with Brooms and Wooden Guns Go through an Absurd Manual of Arms as One of the Between-the-Halves Features of the Annual Army-Navy Game, the High Spot in Athletics for the Year; Below, Naval Academy Fencers Demonstrating Their Skill in the Use of the Rapier

Two Enormous Poo's Are Used to Make an Expert Swimmer of Every Future Officer; Below, the Navy Team Wins a Free Toss for a Foul in an Intercollege Basketball Game on the Gymnasium Floor

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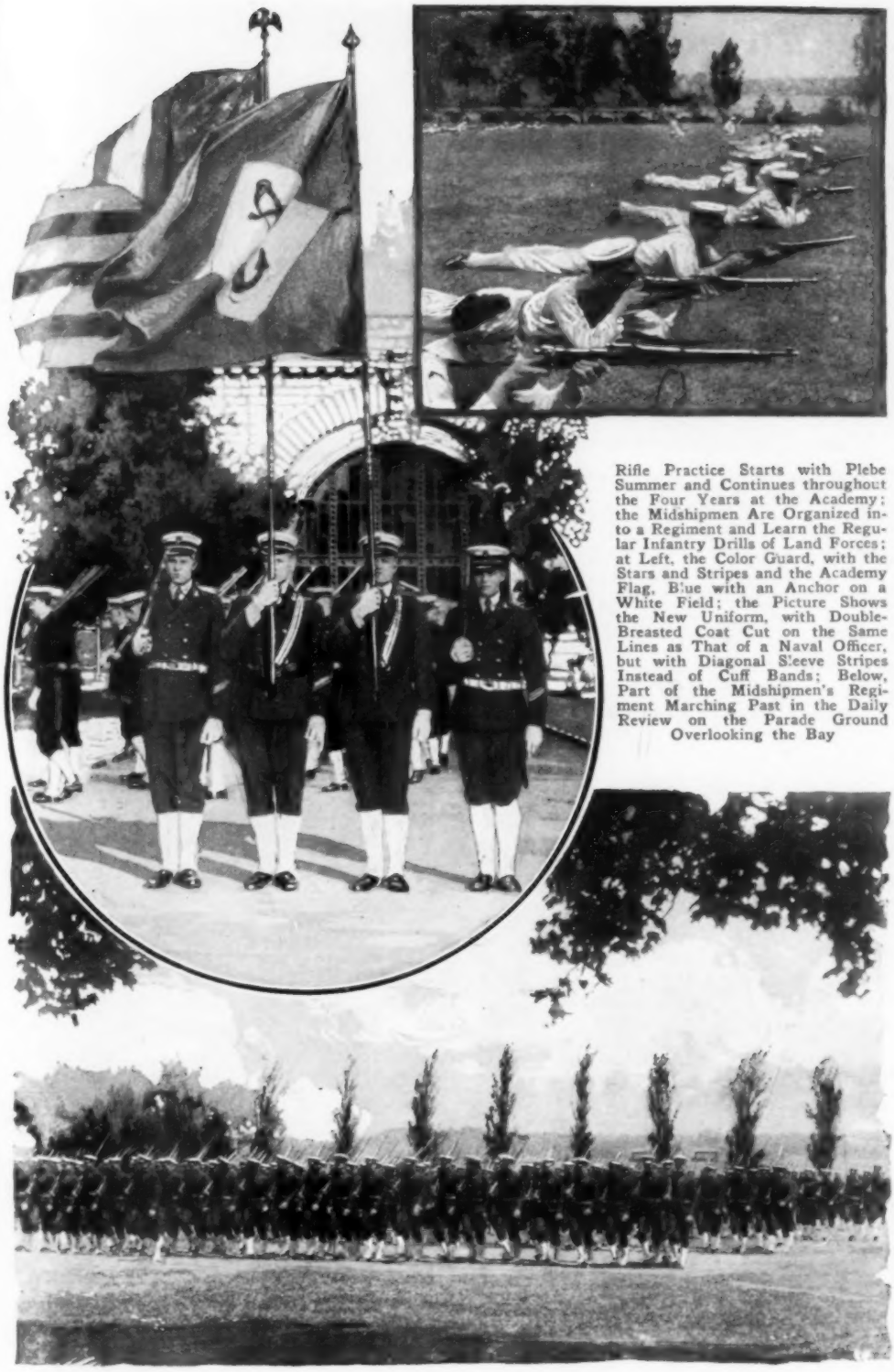
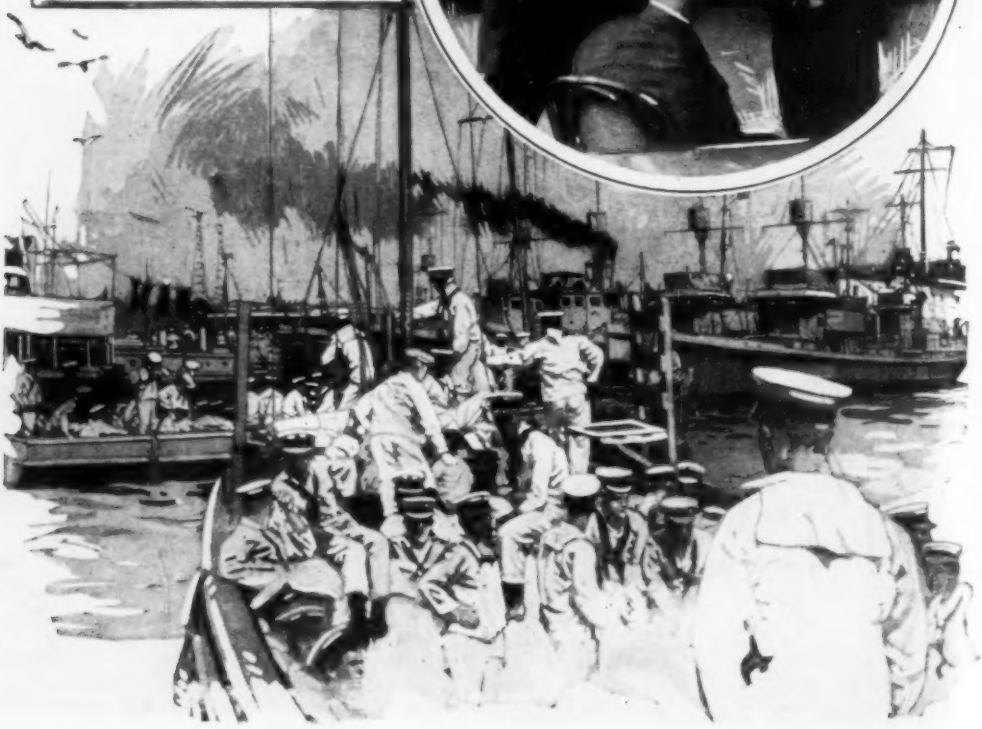


Rifle Practice Starts with Plebe Summer and Continues throughout the Four Years at the Academy; the Midshipmen Are Organized into a Regiment and Learn the Regular Infantry Drills of Land Forces; at Left, the Color Guard, with the Stars and Stripes and the Academy Flag, Blue with an Anchor on a White Field; the Picture Shows the New Uniform, with Double-Breasted Coat Cut on the Same Lines as That of a Naval Officer, but with Diagonal Sleeve Stripes Instead of Cuff Bands; Below, Part of the Midshipmen's Regiment Marching Past in the Daily Review on the Parade Ground Overlooking the Bay

Above, Ships' Libraries Provide Plenty of Reading for Idle Hours on the Summer Cruises; at Right, Students in "Juice," Otherwise E'ectricity, Demonstrating Their Problems with Blackboard Drawings; a Well-Equipped Mechanical-Drawing Department Teaches the Midshipmen to Illustrate Their Ideas Accurately; Below, the High Spot of the Plebe's Year Is When Graduation Is Over and He Embarks on Tenders for the Battleship Squadron Lying in the Bay, Ready for His First Summer Cruise



PROGRESS IN RADIO AND FLYING SHOWN BY ARMY STUNTS

Radio communication between persons on the ground and men in airplanes moving at an altitude of nearly 3,000 feet and an invention whereby pictures may be made at great heights in the darkness, are recent developments in wireless and aviation. Spectators at an army show in Chicago watched three ships obey commands spoken from the ground by an observer who called to one of the flyers equipped with headphones. The latter replied to the messages through a small broadcasting outfit carried in the cockpit. The voices were picked up by a larger station and rebroadcast for the benefit of radio fans. Despite the roar of the propellers, it was possible to understand the pilot with little difficulty. The night-picture plan involves the discharge of a hundred pounds of flashlight powder carried in a bomb trailed at a distance of nearly 200 feet behind the plane. Experts estimate that the flash will illumine four square miles of ground area sufficiently for registering an exposure. Army officials point out that this invention will be of great importance in locating battleships and in correcting the range of guns at night. Another development in photography for special use in the air is a prism camera that takes pictures directly on sensitized paper so they can be developed and delivered in five minutes.

SKYSCRAPER BUILT FOR BIRDS TO SAVE ROOM AND WOOD

When materials are limited as well as space, even bird houses sometimes have to be planned on economical lines. An eastern naturalist devised a style that met the demands of a crowded yard and a shortage of supplies in an ornamental skyscraper pagoda that housed several families of martins. There are four separate compartments or stories on a single post and each is provided with its individual landing.

BERRY TRAY WITH CURVED SIDE FITS PICKER'S BODY

To enable berry pickers to work with both hands, a combination picking tray

Berry Box Holder in Working Position and Turned Edgewise to Show Curve That Fits Body

and carrier has been constructed. One side of the tray is shaped to fit the body so as to hang steady and close to the picker's hands. A revolving cord holder permits the tray to be held straight or tilted.

PHOTO TAKEN IN STOMACH

Photographs showing a complete view of the interior of the stomach have been taken with a tiny camera connected to a metal tube which is pushed to the proper depth through the patient's mouth. Inside of the tube are lenses, and a small electric lamp at its end illuminates the organ while the photograph is being taken. The pictures are said to greatly aid physicians in the treatment of stomach diseases.

¶ Valued at $10,000, a private collection of 16,000 moths is now housed in the Carnegie museum at Pittsburgh.

UNDERGROUND RADIO IS HEARD ACROSS THE CONTINENT

Using an underground transmitting antenna, a radio operator in Maryland not long ago successfully broadcast signals to Los Angeles. Four cables, laid three feet below the surface and radiating from a center like the spokes of a wheel, were employed in conjunction with a set of 350-watt tubes. The operator expects to accomplish transoceanic broadcasting with a 600-foot cable, and contends that the crust of the earth is a better medium for transmitting radio than the air.

End of Underground Radio Antenna Which Carried Signals from Maryland to Los Angeles

ALUMINUM MADE NEARLY PURE BY NEW REFINING PROCESS

Aluminum almost 100-per-cent pure is to be made available in commercial quantities through a recently developed refining process, according to reports. The term "pure" is a relative one, but the highest purity percentage until this latest discovery, was placed at 99.7 while some of the new product is said to be as pure as 99.983. Copper is the principal foreign substance, but there are traces of iron and silicon. Melted salts of sodium, aluminum and barium fluoride are used in the refining process. The impure molten metal is carried upward by an electric current to the top of the layer of salts, where it is separated and poured or ladled off in molds. The pure residue has a beautiful silver color and a luster which it retains for a considerable time. Because of the low content of iron and silicon, the usual bluish tinge seen in the ordinary kitchen utensil of aluminum is eliminated. The first of these impurities causes a grayish color and the second a purplish shade, and either makes the metal turn dull and lusterless after brief exposure.

PAINT ACTS AS THERMOMETER

Paint that changes its color whenever a certain degree of heat has been attained, is the product of a Swedish chemist. Its natural color is a bright red but when the surface to which it is applied reaches fifty degrees centigrade, it changes to a dark brown. It resumes its original hue after cooling. Employed on pipes, motors and other equipment subjected to heat, it would serve as a safety indicator to warn of dangerously high temperatures.

FRUIT SHEAR AND BAG ON POLE MAKE PICKING EASY

Much climbing and reaching among orchard trees is made unnecessary for the fruit picker by a pole to which a pair of shears and a bag are attached. The snippers are operated by means of a cord running the length of the pole, and as the fruit drops it can be caught in the sack, preventing bruising or loss on the ground. The implement, which was devised by an Iowa inventor, eliminates the need of ladders for plucking trees of ordinary height, saving the gatherer many risks and falls, due to improperly balanced footings. As it can be operated from the ground, the picker also protects the trees from damage caused by the weight of the worker climbing over weak branches.

Names and addresses of manufacturers of articles described in this magazine will be furnished free by addressing our Bureau of Information.

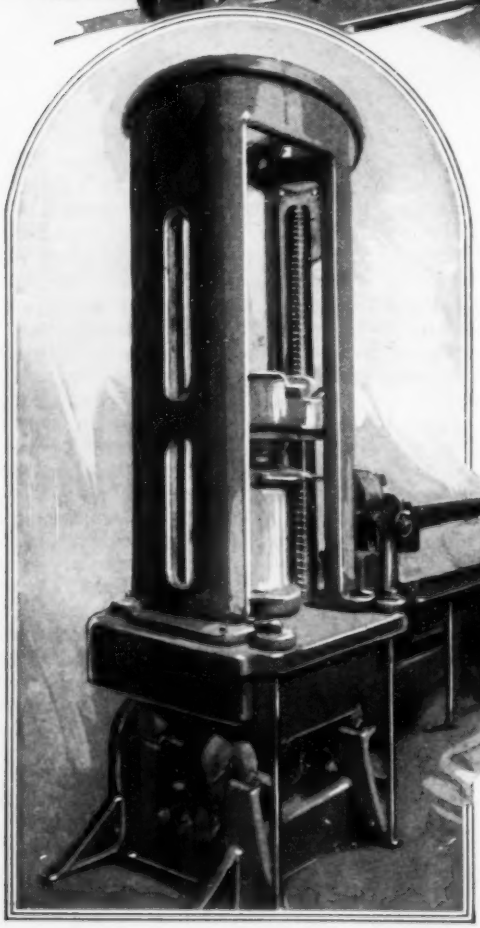
How Science is Transforming Industry

Concrete Culvert Pipe Meets Rigid Scientific Tests Before It Is Installed

"A PAIR of white canvas shoes with rubber soles," the customer ordered. The clerk ran up the ladder and brought down a box, opening it with a flourish and revealed—a pair of pink shoes! Another box was hurriedly opened, with the same result.

The manufacturer was notified, but could offer no explanation. The shoes were white when they left the factory, yet dealers were sending back crates of pink canvas footwear with indignant letters demanding refund of the purchase price. Finally a chemist was called in, and solved the mystery. The shoes had been whitened with zinc white, and had rubber soles. The rubber manufacturer, it developed, used aniline oil as an aid to sulphur in vulcanizing, and aniline oil has an affinity for zinc, turning it pink. The oil was dropped from the process and the trouble ended. Such experiences have given the scientist a firm place in industry, making his art even an industry in itself. He is called in by hundreds of manufacturers to tell them how to regulate the quality of raw material, how to find cheap substitutes for high-priced materials, to control formulas, temperature, pressures, time and spacing, and other factors which influence output, to minimize wastes and turn them into profits, and to discover what a process will do before large sums are spent in developing it. Recently more than 130,000 gallons of a synthetic alcohol called methynol, poured into New York from Germany within two months. In the preceding month only forty gallons of the stuff had been imported, and in the entire previous year less than fifty gallons. An investigation was started to find what caused the

Sifting Cement through Wire Sieve Finer than Silk, Is a Government Requirement



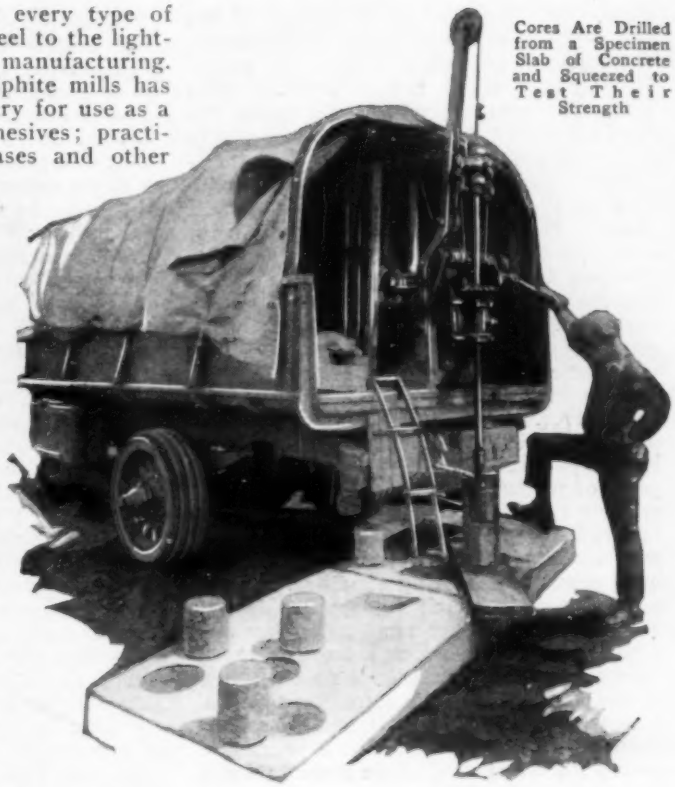
Operating an Abrasion Device, and Below, Testing a Concrete Cylinder in Machine That Applies to It 300,000 Pounds' Pressure

sudden demand for this particular alcohol, and why it should be imported. The discovery was made that the German chemists had found a way to produce it for from eighteen to twenty-six cents a gallon, while it cost seventy-five cents to make by the process used in America. One of the pioneers in commercial chemistry relates that his first client was a paint manufacturer who was interested in a German material called "lactarine," as a substitute for glue in water colors. Its advantage was that it rendered the paint insoluble after drying. The manufacturer wanted to arrange to import the material from Germany, but investigation showed that the price, after duties were paid, would be prohibitive. The chemist, however, found the material was simply ordinary lime combined with casein, a milk product. He proposed that the manufacturer make his own casein and showed him how to set up a plant, produce the stuff and combine it with lime. The little paint factory was soon doing a $2,000 a day business.

The participation of science in industry has made possible the substitution of cheap selenium for pure gold in the production of ruby glass, the substitution of tungsten points for platinum on spark plugs and other electrical contacts, of silica ware for platinum laboratory dishes, of casein for glue in paint, of zein, a corn product, for dangerous shellac in varnishing confectionery, and has made

possible specifications for every type of metal, from the hardest steel to the lightest aluminum alloy used in manufacturing.

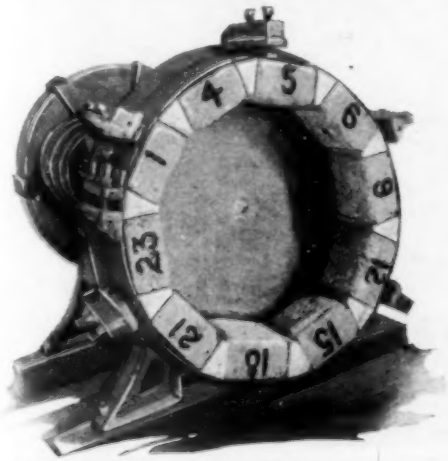
Waste liquor of the sulphite mills has been reclaimed by chemistry for use as a source of alcohol and adhesives; practically all of the waste gases and other products of coke plants are turned into valuable commercial channels, including dyes and fertilizer; smelter fumes, cement dust and similar industrial waste are now reclaimed and sold. The chrome process of tanning leather was virtually unknown in this country until a chemist took the basic patents, developed the idea further, and actually demonstrated the method to skeptical tanners. Now more than ninety per cent of all the leather produced is tanned in this way.



Cores Are Drilled from a Specimen Slab of Concrete and Squeezed to Test Their Strength

An industrial laboratory operated by Lewis Institute, a middle western college, has devoted years to the study of concrete. Some forty experts are working there constantly to reduce the science of cement from its hit-and-miss methods of twenty years ago to an exact formula.

Although now over 100 years old, cement was not widely used in America until the 90's. Then people began to boast of their cement sidewalks; later, farmers found that it paid to build concrete silos and dairy barns; wooden bridges were replaced with concrete structures; the motor car brought a demand for improved highways, and thousands of miles of cement roads have been constructed.



Steel Balls Pound against These Blocks When They Revolve, Testing the Concrete's Resistance to Wear

But it was early discovered that there existed but a "little knowledge" about concrete. Thus it was found that the amount of water mixed with the sand, pebbles, and rock, was just as important as the amount of cement; that putting a pint too much water in a batch of concrete was just like leaving out two pounds of cement, in its weakening effect. Schoolboy methods were used in mixing some of the earliest cement roads and sidewalks, with the result that these soon crumbled and wore out, whereas, using modern scientific methods, present construction gives every evidence of withstanding centuries of wear.

It was discovered that, by keeping a concrete road wet for ten days after it is placed instead of letting it dry out, its resistance and wear was increased by two-thirds. "A minimum of water in mixing concrete, and a maximum for curing it will give the greatest strength," advises

Prof. Duff A. Abrams, in charge of the research laboratory of the Lewis Institute.

There was no rule of thumb nor guesswork about these tests. Nothing was taken for granted. Just gaze upon the "sand library" of the laboratory, where you may see some 3,000 bottles in glass-covered cabinets and you have some idea of the research into the sand field alone. Here you may see sands from every part of the United States, Canada, Mexico, Cuba and many foreign lands, and each specimen has been carefully tested. Similarly, great heaps of stones and gravels, packed in cloth sacks ticketed with concise data, are to be found in the storerooms. The tests are a revelation in themselves.

Down in the basement of the gray stone building that houses the laboratory, a gang of workmen is constantly employed making cylinders of concrete, six inches in diameter and a foot tall. Identified with black-paint numbers, these cylinders later pass to the curing chamber. This is a long room in which a perpetual shower bath of mist is kept running. Day and night, a spray as thick as a London fog is kept circulating through the room. Most of the cylinders remain here for a period of a week or four weeks; some of them are kept under the spray for a year; still others for five years, while some will not be called out for ten years.

Upstairs, where the majority of the testing machines are placed, these cylinders are carried to give their testimony. A young engineer in a gray-flannel shirt stands before one of the big testing machines. In its looks is something reminiscent of a glorified old-fashioned hay scale, with an outreaching lever arm to measure the load. In reality it is a machine capable of applying 200,000 pounds' pressure. The cylinder passes under the press and the pressure is put on.

Finally, with a crack and crash, the cylinder breaks and the pieces clatter down into a waiting wheelbarrow. The young fellow notes a few figures in a book, and another cylinder goes into the machine. "It is from these figures that we get our averages," says Prof. Abrams. "We know what went into the cylinder and how it was mixed and cured, and the figures show how much load it withstood. So, after some thousands of tests, we can tell, with pretty accurate reasons, just what can be expected from that particular mix of concrete, and whether the sand and pebbles are the right kinds to use."

Besides the 200,000-pound testing machine, there is a 300,000-pound machine, two smaller ones, and a 2,000,000-pound machine for testing entire walls. Fineness of cement is described by the percentage that will shake through a sieve having 40,000 holes to the square inch.

Cylinders of Cement Are Filled with Water and Stacked Away; After Hours of Soaking, They Are Carefully Examined to See How Much Moisture Has Leaked Through

SURFBOARD RIDING ON LAND IS THE LATEST SPORT

Surfboard riding on the turf, behind a motorcycle, was introduced recently at the Crystal Palace, London. The boards were attached to fast machines and the skill of the drivers and riders furnished new thrills to the thousands of spectators. It is said that greater ability is required to navigate the surfboard on land than is necessary for its use on water, while the speeds made were often in excess of those that even the fastest of motorboats have ever attained.

Dry-Land Surfboard Riding behind Motorcycle Provides Many of the Thrills of the Water Pastime and Calls for Skill; It Is Done on Turf to Avoid Dust

MEAL MADE OF CORNSTALKS TO FEED CATTLE

Cornstalks usually are numbered among the waste products of the farm but it has been discovered that they contain nutritious properties that make them suitable for cattle feed. In their natural state, they are too hard to eat but a mill is now on the market that converts them into a palatable meal that may be mixed with the other food. It may be run by the tractor, or a separate gasoline or electric motor, and is equipped with sixteen hammers mounted on a cylinder that turns at the rate of 3,000 revolutions per minute, to pound the stalks into a coarse flour. Dirt and other foreign substances are removed by a blower.

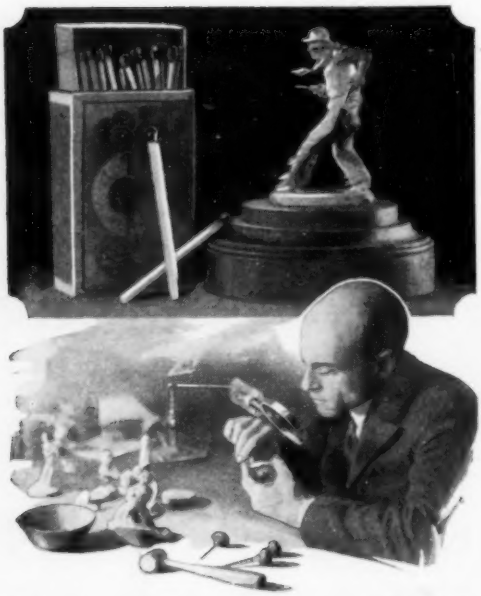
WHEN PLANTS SLEEP

The riddle of sleep, which scientists for centuries have endeavored to solve, is likewise perplexing in the case of plants, for their habits in this particular are widely different. A variety of sensitive plant, the mimosa, gets drowsy and folds up its leaves on the slight provocation of a dark cloud passing over the sun, while the night-flowering cereus bursts open only at the approach of darkness. Some plants go to sleep at midday while many kinds of aquatic flowers open at dawn and close at night with great regularity. Plant sleep is said to vary from ten to eighteen hours and is believed to indicate a nervous system in vegetable life somewhat akin to that of animals.

KENNEL ON RUNNING BOARD HAS GLASS WINDSHIELD

For the convenience of dog owners wishing to take their pets with them on automobile journeys, a compartment has been designed by an English motorist to carry his bulldog, which acts as guardian while the car stands unattended. The upper part of the inclosure is of glass, and it can be placed on either end of the running board.

Cosily Seated in Running-Board Kennel, Dog Is Protected by Blankets and Glass Windshield



Carving Figures from Billiard Ball, and One of the Statuettes Compared with Match Box

STATUES FROM BILLIARD BALLS SHOW CARVER'S SKILL

Art of the Chinese ivory carvers is rivaled in the creations of a New York sculptor who cuts miniature statues and other figures from billiard balls. He uses only a magnifying glass, a few small chisels and other simple tools and yet is able to incorporate so many realistic details in his work that the finished products resemble faithful reproductions of sculpture of heroic size. One of his pieces showing a motion-picture actor, weighs less than an ounce and is but little over two inches high, yet is very lifelike.

AFRAID OF THEIR SHADOWS

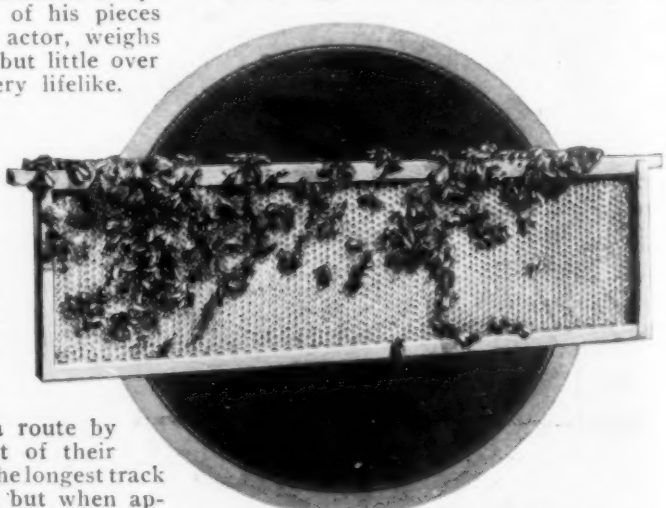
A belief still exists among many African natives that one may have his shadow stolen or lost through carelessness, indicating an approaching calamity. For this reason it is impossible to persuade them to convey a white man's baggage on a route by which they will lose sight of their shadow. They will march the longest track on a blazing-hot morning, but when approaching a stretch of open ground, where their shadows would fall behind them, they go around it even though the journey may mean a day's extra toil, rather than allow the appendage to get out of sight.

RADIO PROGRAMS ARE BOTTLED FOR FUTURE BROADCASTING

Radio programs from America are "bottled" and re-broadcast a day later to European listeners by mean of a system a German inventor has devised. His equipment consists partly of a long, hard steel wire which is run on spools through a powerful magnetic field. As the impulses are received, they are stored within the wire and when it is run through the broadcasting apparatus later, they are re-sent just as they were registered.

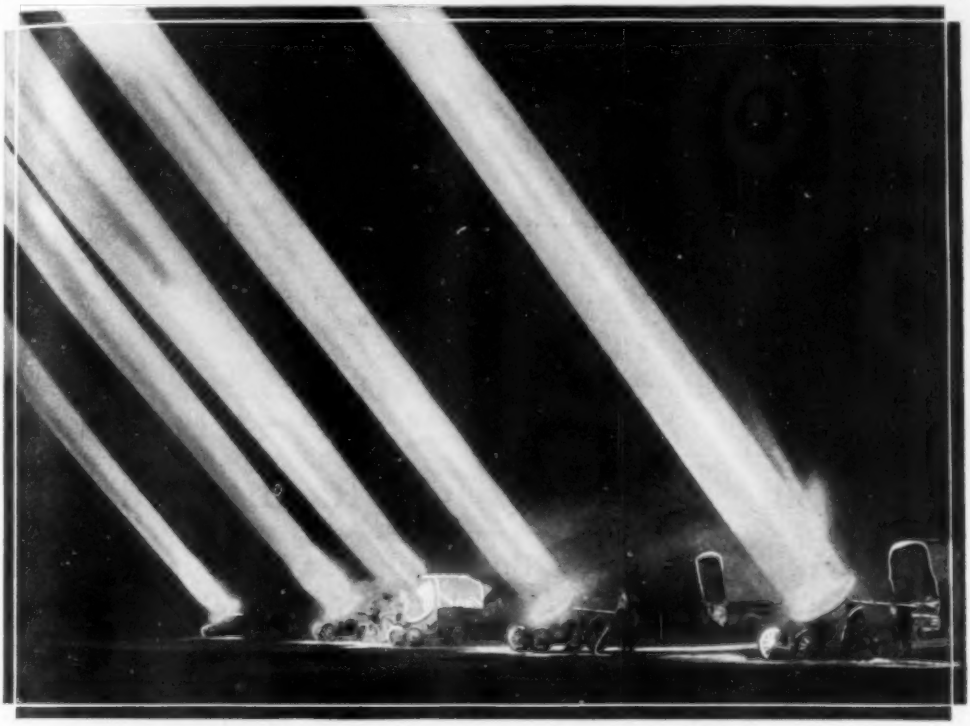
BEES' HONEY OUTPUT DOUBLED WITH ALUMINUM COMBS

Bees will be able to store up more than twice as much honey with aluminum combs that are being made for them. It is figured that it takes fifteen pounds of honey for the bees to manufacture a single pound of honeycomb. Since they require several pounds of wax in which to store their honey, they will save at least seventy-five to a hundred pounds of honey by using the manufactured holders. The metal combs are painted with pure beeswax and are used in the production of extracted honey, where the combs are placed in a machine, called a honey extractor, and whirled around and the honey thrown out by centrifugal force. The empty combs are returned to the bees for refilling.



Bees on Comb of Aluminum That Is Molded to Form and Coated with Wax

BATTERIES OF SEARCHLIGHTS TO REPEL AIR ATTACK



Like the Barrels of Luminous Cannons, Rays from Battery of Powerful Searchlights Pierce the Darkness and Are Swung in Wide Orbits in Search of Hostile Airplanes

One of the interesting features of the joint army and navy maneuvers in Hawaii was the work of the batteries of monster searchlights. Mounted on small, rubber-tired trucks, the lights were operated in groups of five each. So powerful are these lights that, in one test for range, a pilot went up 8,000 feet, at which height he saw the beacon coming over the horizon. This was estimated to be at a distance of 130 miles. The lights have only two limiting ranges, one the geographical, which depends upon the curvature of the earth, the altitude of the beacon and the observer, and the other the visibility range, which depends upon the amount of haze or mist in the atmosphere.

HOUSES BUILT OF PRESSED CORK TO SAVE FUEL

Slabs of pressed cork, two and four inches thick, form the exterior walls of two steel-framed houses being tested in England. The cork is said to be nearly fireproof, greatly deadens sounds and acts as insulation that will save approximately twenty-five per cent of the fuel for heating purposes, it is estimated. Both the framework and the slabs are covered with concrete applied with a cement gun. An additional advantage of this type of construction is that the house is more attractive and more nearly resembles one of wood than the all-steel dwellings which have been criticized because of their unsightly appearance.

BOTTLE OPENER FITS ON WALL AND PREVENTS SPILLING

Caps are quickly pried from bottles with a curved metal opener that can be screwed to the wall or any other convenient place. Downward pressure easily lifts off the top, and as the bottle is not shaken or jarred, there is little danger of the contents spilling.

Using a Fire-Truck Ladder to Reach the Top of the Half-Filled Balloon "Detroit," to Repair Broken Netting before Start of National Race

Bumping the Clouds in a Racing Balloon

Victor Tells How It Feels to Speed Up and Down Air Currents in Freezing Temperatures More than Two Miles above Earth

By W. T. VAN ORMAN

(Winner of National Balloon Races in 1924 and 1925)

IT is not far as the air-mail plane would fly, from St. Joseph, Mo., the starting point in the 1925 national balloon race, to the little town of Reform, Ala., just east of the Mississippi line. The contest committee, when C. K. Wollam, my flying partner, and I landed there, computed the air-line distance at 585 miles, which is not a particularly impressive jaunt in these days of fast trains and faster airplanes.

But for Wollam and myself the flight represented thirty-seven hours and forty-six minutes of the most difficult ballooning we had ever experienced over a curved course considerably longer than the air-line distance as well as 12,000 feet and more straight up and in near-zero temperatures. A puffy and ever-varying wind, requiring constant attention to the instruments and incessant nursing of the gas and ballast supply, made our little trip a man-sized journey.

When we won the national race out of San Antonio, Tex., last year, we covered 1,073 miles and were in the air forty-four hours. That was almost a pleasure ride compared to this year's flight.

Trouble started before we had left the ground. Up to the day of the race we had anticipated a fine, healthy wind out of the southwest to blow us northeastward into Canada, and we had high hopes of setting a new American distance record. On the day of the race, however, wind and weather conditions were in a peculiar balance. The southwest wind, after blowing steadily until the night before, became gusty, and then started to veer, until an hour before the start it was in the northwest.

The brisk wind made the job of filling the gas bags harder, and while the line of contestants was still taking on gas, the aged balloon net of Capt. R. E. O'Neil, one of the army entries, was ripped to pieces by an extra-strong squall. After a study of the weather maps it was apparent that another change in wind drift might be expected, and that it was probable our course after the first night might, after all, be north and east over the Great Lakes.

As the time limit for starting prohibited our waiting for the anticipated change, we decided to ride out the wind into the south and then, if possible, take whatever advantage might be offered by any more favorable wind into the north, with maximum distance as our goal.

We left the ground at 6:08 p.m., without incident and rose to approximately

Filling the Balloons from Rubberized Canvas Gas Main, Top; a Basket and Balloon Envelope in Its Bag, Above, and Lieut. Haynie McCormick's Wireless, at Left

2,000 feet, our basket literally covered with sand-bag ballast. Evening is usually chosen for the start of a balloon race because the gas is cool and contracted, allowing much more to be forced into the bag, and also because the long cool night will allow a good start on the trip before the next day's sun expands the inflation mixture.

At 2,000 feet we reached equilibrium —the point where the lift of the gas just equals the weight of basket, crew, instruments, equipment and sand bags— and there we leveled away on our journey. We were again flying the 80,000-cubic-foot "Goodyear III" in which we had won the national contest in 1924, and the same balloon which we raced in the James Gordon Bennett international race in Belgium that year. In the basket we had plenty of food for a prolonged flight and held high hopes of duplicating our last year's victory.

At dusk we passed over Kansas City, still flying so low we could hear the rumble of traffic in the streets and see the twinkling lights in the homes and office buildings below. It was dark on

Hydrogen from 210 Cylinders Was Mixed with Coal Gas from City Mains to Fill Each Balloon in the Race

the ground, but up where we were there was still some light. Ahead of us, and slightly to the east, we could see Maj. Maurice Smith, a non-contestant, flying a 35,000-cubic-foot balloon as pilot to the racers, and the "S-14," an army bag piloted by Lieut. William J. Flood and his aide, Lieut. Haynie McCormick, both of Scott Field, Ill. They were at a higher altitude, around 5,000 feet, and at that height the sun still shone on their bags.

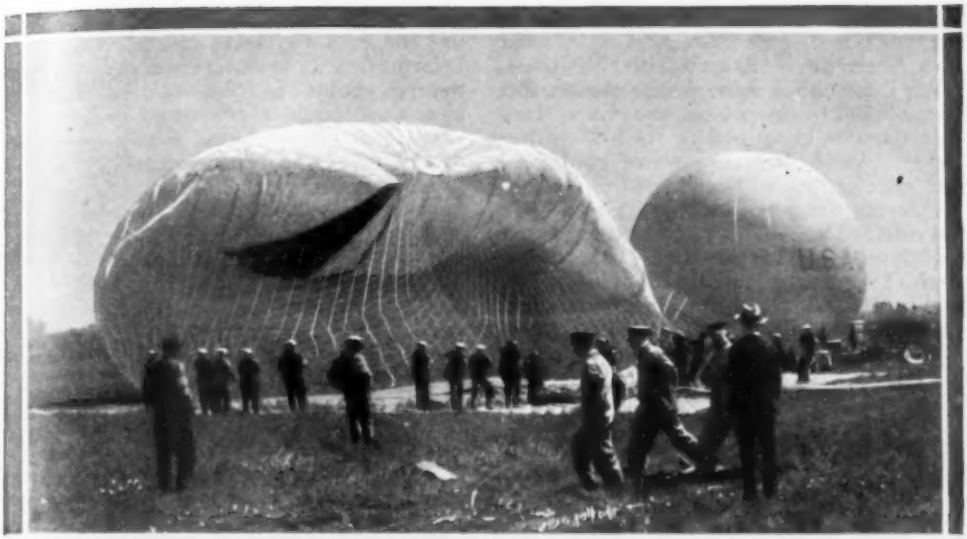
The air was gusty and uncertain. Constant attention was required to maintain equilibrium and keep the balloon from running wild on the frequently recurring up-and-down drafts. Radio, as is now generally known, has simplified ballooning and brought real pleasure for the long and tiresome night hours. At 10:40 we tuned in the Goodyear Tire & Rubber company station at Cleveland, on our little portable set and heard a special program given for us. Far above the interference of power lines, street cars and other annoyances of the earth-bound radio fan our lightweight dry-cell receiving set worked well over tremendous distances. If you can imagine all ground interference removed you can realize the joys of radio in a free balloon.

It would be difficult to describe my feelings, floating there 5,000 feet above the Ozarks, with a half moon shining overhead, to hear my wife's voice come to me through the loud speaker wishing me good fortune and an easy landing. A bit later Mrs. Wollam, standing before the microphone in Cleveland, delivered a similar message to my companion.

The air continued to be unstable as the night wore on. Frequently the bag rode down a long slanting air pocket, and then up another, rising and falling like a small boat in a heavy sea. As much as possible we avoided dropping ballast or valving gas to offset these dips and rises, preferring to ride them out rather than sacrifice either sand or gas which we knew we would need the next day. In either rising or falling a balloon gains momentum unless checked by a change in the air or establishment of a new equilibrium. Changes in the terrain below, hills or valleys or even the woods, affect the air above and are responsible for many of the choppy currents that keep the balloon pilot constantly on the alert. A body of water may also change the temperature of the air above it and, by cooling the gas rapidly, cause the balloon to shoot earthward at an alarming pace.

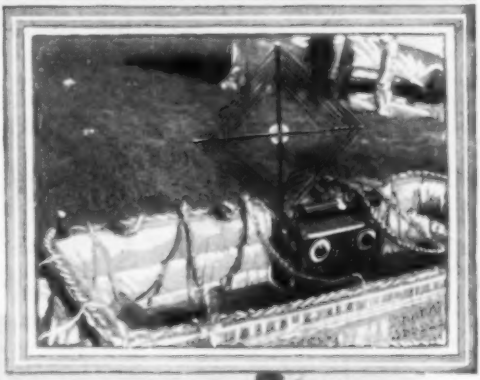
Throughout the night the radio helped us keep awake, for thirty-two widely scattered stations were broadcasting programs for us, giving not only the wind and weather conditions needed to plot our course, but also music. We had not wholly given up the theory that the winds might change to a more favorable direction, until the next morning when a Des Moines station gave us our best course, that being toward the South Atlantic states and the same we had pursued from the start.

We were supplied with small sounding balloons, not much larger than the circus-day toys, and sending one up attached to a light cord, we found a stronger breeze



blowing and prospects of better speed at the higher altitudes.

We rose to 12,000 feet when we found the wind we wanted, still blowing us to the southeast. At this level, although muffled in heavy leather and fleece-lined aviation tunics, we suffered considerably from the cold, the thermometer registering fifteen degrees and less above zero. In this somewhat rarefied atmosphere we called on



Wreck of an Army Bag in the High Wind before Race, at Top; Radio Set Strapped to Side of the Basket, Center, and Laying Out of Balloon on Its Ground Cloth to Be Filled

our oxygen bottles to help out our laboring lungs, and settled down to experiment with the radio and maintain a logbook.

We were above most of the clouds, out in the bright sun, where the warm rays kept the gas expanded to its best lifting power. With our glasses we could see the ground more than two miles below through an occasional rift in clouds and mist. The next day of the trip passed frigidly but uneventfully, with little to do, since the gas bag was taut and the wind fairly steady. Only occasionally did a higher cloud come between us and the sun and call for quick work to stop the downward rush of the balloon when the gas contracted as the warm sun rays were shut off. Flying beneath clouds calls for rather skillful navigation, and trying to go up through one is still harder. As the balloon rises with its gas warm and comes in contact with the cold cloud mist the sudden temperature change sends the bag scooting downward, for all the world like a resilient ball bounced off the ceiling. Then precious ballast must be sacrificed to stop the rush earthward.

Our only comforting thought was that our radio still functioned and brought in good music to divert our minds from the somewhat uncomfortable surroundings. Saturday night, the second night of the race, and shortly after we had crossed the Mississippi river into the state of that name, the radio brought word that two of our friends and race rivals had been forced down. This information, together with the reception of a clever dance program, bolstered us both up exceedingly and, with a good chance at the victory in sight, we sat through another cold night. Sunday morning we valved out gas and took a long drop back toward earth, leaving the cold air strata in search of some information as to where we were and the nearest point of any consequence by which we could check our course.

Down a country road we saw a group of children, apparently on their way to Sunday school, but halted open-mouthed in their tracks at the spectacle of a wicker basket and a huge gas bag dropping out of the heavens. When the altimeter showed about 1,500 feet we checked the descent, and Wollam peered over the side and called down to ask where we were. The children were too awestruck to heed his request for geographical information.

A little later we passed over another group, one of whom answered the query with the name of the county.

"What's the nearest city?" Wollam yelled, leaning far over the side of the basket in his eagerness.

"We dunno," came back the farmer boy. "We go by counties down here."

With our ballast supply low and the gas in the envelope nearly exhausted the need for a landing became imminent, and we picked out a likely looking field skirted with trees, and, despite a thirty-five-mile ground wind, made a safe, though somewhat abrupt landing.

It was good to stretch our legs after the hours in the cramped space of a five-foot square wicker basket, and enjoy a smoke, a luxury of course denied while we were aloft. Several natives appeared and assisted willingly in preparing the balloon for shipment. They told us they not only had never seen a balloon before, but likewise had never seen an airplane. From them we learned that the little town a short distance away was Reform, Ala.

Stretching the Silken Envelope on the Ground Cloth for Filling

ROADWAY RAISED AS A BARRIER TO GUARD CROSSINGS

Barricades operated by hydraulic pressure applied by the trains, have been suggested for prevention of accidents at railway crossings. They are to be constructed as triangular platforms elevated from the road level by the weight of the engine and cars, and sink back to a horizontal position when the train has passed. Vivid "Stop" signs on the sides, illuminated at night, would give motorists ample warning at a distance.

Sketch of Proposed Crossing-Guard Stops in Operation; Weight of Approaching Train Has Raised Barricades from Road Level; When It Passes, They Will Resume Normal Position

WRAPPING PAPER FROM PEAT TO SAVE TIMBER SUPPLY

Further conservation of the timber resources is seen as a result of a process for making wrapping and other coarse paper from fibrous peat as a substitute for wood pulp. Earthy substances are first washed off; then the peat is soaked for many hours in caustic lye, a shorter time in a weak solution of hydrochloric acid, washed again and bleached in alum and chlorine. When it is mixed with a small percentage of rag pulp, it is ready for the final process that turns it into paper. It is estimated that there are millions of acres of this substance that might be turned into profits by developing this method.

SOUTH AMERICAN ONYX FOR U. S.

Onyx suitable for interior-decorating stone is being mined in Argentina and is to be shipped to New York in large blocks. It is expected that this will aid South American commerce as it will help provide return cargoes for ships carrying merchandise from the United States.

CHOPPING BLOCK ON SPRINGS SAVES WORK AND NOISE

Butchers and cooks who chop large quantities of meat are spared fatigue by a shock-absorbing block that rests upon a strong spring It is attached to a frame fixed to a solid support, and is said to "give" just enough to relieve the hand and wrist of the force of the blow without interfering with the cutting of the meat. An additional advantage is that it makes less noise than the usual type of solid block.

Springs on This Chopping Block Absorb Blows

LUXURIOUS LUNCH CARS REPLACING "OWL" WAGONS

Luxurious, movable restaurants with all modern comforts are replacing the old-time "night owl" lunch wagons. The equipment of these lunch cars includes

Modern Lunch Wagons Are Veritable Restaurants on Wheels, Equipped with All Appliances Necessary to Give Speedy Service and Ready to Be Moved to New Locations as Business May Demand

ranges, oyster cookers, electric lighting, sanitary plumbing, steam tables, coffee urns, ice boxes, ventilators and all necessary dishes and utensils. When trade conditions change, the lunch car may be towed to another location. This business has grown to such proportions that dining cars are being built on the basis of quantity production where they are the same in shape, size and interior fittings.

RADIO SWITCH SAVES TESTING TO SHOW IF SET IS ON

The filament switch has become an essential part of every well-designed radio instrument, and a particularly neat example of the latest type is that shown in the illustration. This differs from the usual switch in that the mechanism instead of being "push-pull," is operated by means of a little lever that is thrown up to turn the current on, and down to throw it off. In most switches of the push-pull type there is always a doubt, the first time it is operated, which way it should be thrown to turn the current on, but this switch is provided with a small indicating plate that shows plainly how the lever should be moved. Only one hole need be drilled to mount the switch.

OIL EXTRACTED FROM LOCUSTS LUBRICATES WATCHES

Oil extracted from locusts is being used in South Africa as a substitute for porpoise oil as a lubricant for watches and other delicate mechanisms. The insects are fed into presses which crush them and the resultant oil is refined and allowed to stand for a year. Its quality is then determined by its color, consistency and odor. The solid matter remaining after the oil is extracted, is made into cakes that are used for poultry feed and defray much of the expense of making the oil.

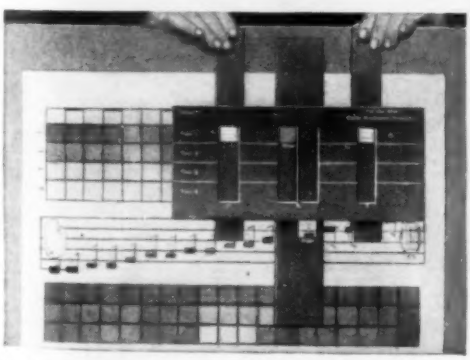
BLIMP'S LOSS LAID TO RADIO

The destruction of the big dirigible airship, "SS-3," of the Japanese government, with the loss of the crew, has been laid to a broadcast radio wave, by Dr. T. Terada, of Tokio university, one of the investigat-

ing board. A miniature model of the ill-fated craft was built by the scientist and covered with a coating of aluminum paint such as was used on the original. Against this surface radio waves were directed and it was found that sparks nearly an inch long were produced by the charge. Similar action may have taken place on the large ship, he believes.

COLOR HARMONIES FROM KEYBOARD

The time spent by artists and designers in studying and selecting proper color schemes can be saved by a harmonizing keyboard, which quickly indicates the correct groups of tones and shades for use with any hue. By placing the key chart against the range of colors on the board, the combinations appear in a series of any desired number of tints. For the color arrangement of elaborate stage settings, interior decorations, posters, embroideries and house furnishings, the keyboard will accurately display the right schemes to go with any shade of background. It is said that no matter what combinations and groups are sought, the chart will introduce no discordant elements.



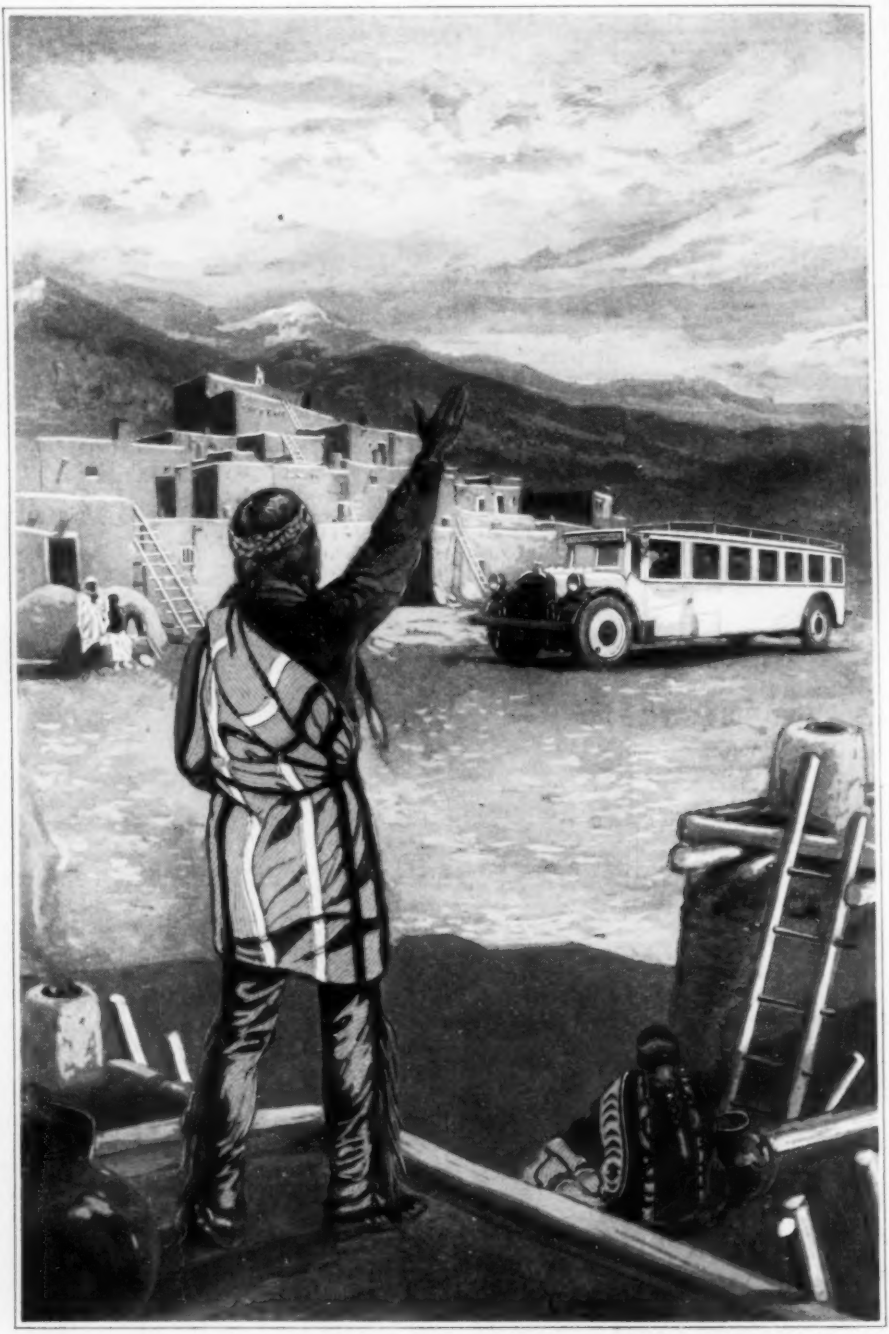
Keyboard Chart Arrangement by Which Harmonious Color Combinations Are Selected

Flag, Beacon and Big Sign on This Conspicuous Lighthouse, Give English Motorists Ample Warning of Dangerous Hill

LIGHTHOUSES WARN AUTOISTS OF DANGER POINTS ON ROAD

Lighthouses surmounted by beacons not unlike those that flash their warnings to ships at sea are being constructed on English roads as safety guides for motorists. The most dangerous points, such as steep hills and crossroads, have been picked for the experiment, and half a dozen of the houses have been authorized. A lettered caution sign, visible at a long distance, is placed to catch the eye of the autoist by day, while the lights at night illuminate it and the trail marks placed above, so that there is little danger of running past the signal. A flag surmounting the top of the beacon is an additional emphasis.

¶ When members of certain African tribes go into mourning, they paint their bodies white.



Pullman Motor Cars Bring the Traveler to the Pueblo Villages and Cliff-Dweller Ruins amid the Marvelous Scenery of the Southwest

The Modern Covered Wagon

By J. EARLE MILLER

TWO travel-stained parlor-car busses rolled into Chicago one evening this spring—the first to complete a round trip to Los Angeles and return. In twelve days going out by way of Denver, and nineteen days returning over the southern route, through El Paso, they tapped vast scenic reaches no passenger has ever seen from a railway train while their balloon tires rolled a broad pattern down the highways made famous by the covered wagons of the past.

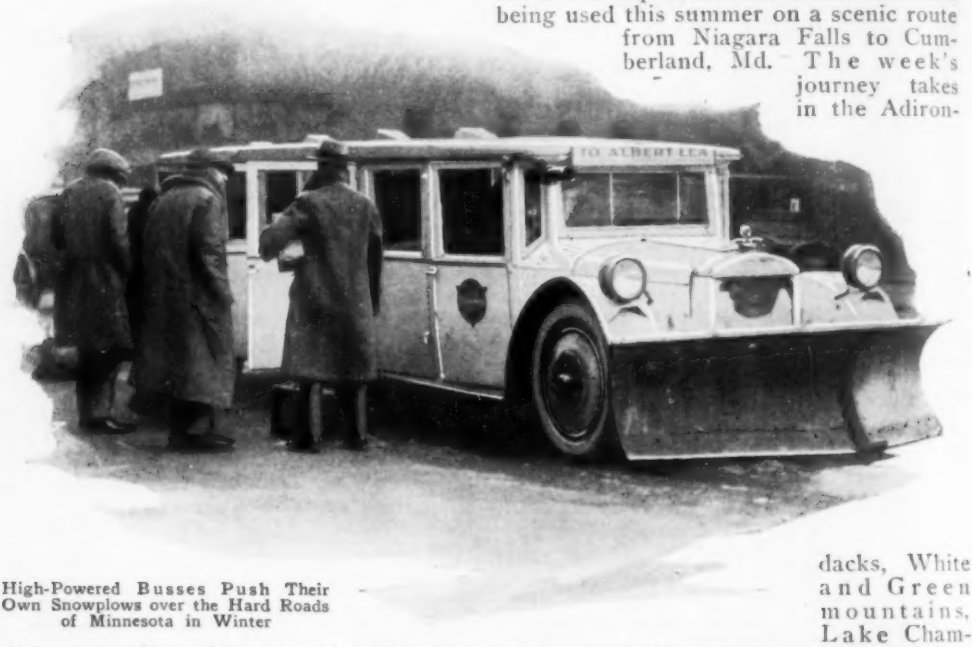
On the long stretches of smooth pavement or macadamized roads, when the steady flow of scenery grew monotonous, the passengers turned their comfortable wicker chairs and over Pullman-type tables played cards or worked cross-word puzzles. As evening fell, the cars stopped at the nearest town, where the passengers spent the night in comfortable hotels.

While these pioneer busses were linking the east with the west, millions of dollars were added to the tens of millions already invested in the nation's newest rival of the railroad. In the populous east and middle west and the coast states hardly a town remains but what is linked to its neighbors by motor bus, while even the far-scattered towns of the west are displacing the old-time stages with faster and better automobile service. The total investment in motor vehicles carrying passengers for a nominal fare in competition with street cars, interurbans and steam roads represents an enormous sum. One hundred and seventy electric railroads alone operate 2,500 busses as feeders to their lines, or to take the place of electric lines abandoned because of the excessive cost of operation. Steam railroads, too, are turning to the motor bus and trucks to take the place of unprofitable branch lines. The Boston and Maine alone is preparing to abandon 1,000 miles of its 2,450 miles of track and substitute motor cars.

While the motor truck and bus business has developed so rapidly since the war that its growth has been in a haphazard way, various state utility commissions are taking steps to systematize the new transportation system. The chief stumbling block to co-ordination has been the widely differing laws of various states, which have impeded the establishment of connecting bus lines across state lines. It is possible to go most anywhere in any eastern state by the short-haul bus lines connecting various towns, but almost impossible to plan a connected journey through three or four states.

While the bus business has grown rapidly in the east, where paved roads are common and where they are kept free of snow in the winter by state-operated plows, there has been some dissatisfaction in the northwest, particularly in the Dakotas and near-by states.

The railroads have capitalized the fact that the bus service halts when heavy snows fall, while the trains keep right on running. Merchants, who at first gave their hauling to the long-distance bus and truck lines, have been particularly impressed with the argument of the railroads that the company which furnished scheduled service every day in the year was, in fairness, entitled to the business. The same argument is being used in Arkansas, where the state wholesale grocery organization has urged its members to support the railroads, not only because of their regular service, but because of the high taxes they pay the state.



High-Powered Busses Push Their Own Snowplows over the Hard Roads of Minnesota in Winter

Despite these complaints, several of the railroads themselves have seen the wisdom of entering the bus business, if for no other reason than to protect their investment by keeping rivals out. Busses operated by many railroads are displacing the old accommodation trains and giving better service too. Fast freight lines and feeders to off-the-line points promise to help the railroads recover some of the revenue lost by the turn of thousands of passengers to travel in their own private automobiles.

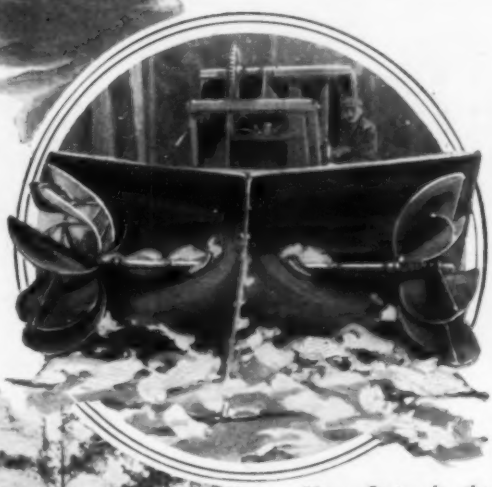
The interstate commerce commission has records of more than 1,500 bus lines established in 1924 by both railroads and private individuals, with a total rolling stock of 5,400 busses, costing upward of thirty million dollars. Outside of the city and suburban-town business, where the bus is seriously threatening both the street railway and interurban and steam roads, an entirely new field is opening up for the bus in purely scenic tours. The cross-continental trip which terminated successfully in Chicago this spring was an interesting venture years ahead of its time, but on trips of 100 to as much as 2,000 miles, the sight-seeing bus is already well established. The same two cars that made the trip to the coast and back are being used this summer on a scenic route from Niagara Falls to Cumberland, Md. The week's journey takes in the Adirondacks, White and Green mountains, Lake Champlain, revolutionary war scenes, the Sleepy Hollow country, New York, Atlantic City, Baltimore, Philadelphia, Washington, Mount Vernon, Valley Forge, Gettysburg, Harper's Ferry, Antietam battlefield and the Cumberland plateau. Much of it lies over beautiful mountains and down gorgeous valleys untouched by any railroad. Similar sight-seeing tours are operated from various cities throughout the east, extending as far north as Montréal and Quebec.

In the west, one bus company is operating a line of pleasure coaches in the Bad Lands of South Dakota, including some of the finest scenery in North America; busses have entirely displaced the stagecoaches in the Yellowstone and are being used extensively in other national parks; hundreds of big busses link the coast cities from Seattle to San Diego with the mountains and forests, and a regular stage line operates from Los Angeles to El Paso, Tex., crossing the desert and

Latest Busses Are Speedy and Comfortable

mountains day after day on schedule time. Three busses made the trip from New York to Los Angeles last fall, but remained on the coast to enter the business there. Like the two from Chicago, they took the northern route west through Denver, then southward through Colorado Springs and Pueblo, over Raton Pass and down into New Mexico; from there either south through Santa Fe and Albuquerque, or west to Taos, and so to Los Angeles.

Coming back, while the winter's snows still lay deep on the high passes of this route, the busses took the southern trip to El Paso. First, trouble was encountered at the famous plank road laid across the desert in southern California. The road, built in sections which can be lifted out and on top of the constantly shifting sands, was but ninety-four inches wide, and the busses measured ninety-



Many States in the Snow Belt Keep Their Main Paved Highways Free of Drifts So That Millions of Dollars' Investment May Be Used the Year Around

Balloon Tires and Powerful Trucks Have Replaced Horses in the Lumber Camps

The Pacific Coast Is Only Twelve Days from Lake Michigan by Bus, with 2,000 Miles of Plains, Mountains and Wonderful Scenery in Between

painful regularity, but the climax came when a grade-crossing tunnel beneath the Texas-Pacific railroad was reached, and it was discovered the tunnel sides were too close together to let the bus body through. A detour was made to a road that went up and over the railroad embankment, but when the front wheels reached the railroad line it was discovered the bus body was so long and so low that its middle was aground, with the back wheels still far down the slope. The railroad was tied up for more than four hours while old ties were collected, the busses jacked up and a wooden bridge laid beneath the rear end to get it over the hill.

two inches, yet they only left the road twice in its nine miles. From there everything went well until after El Paso was passed and the road curved northward toward Missouri.

The mesquite thorns, invading the narrow country trails, punctured tires with

Part of City Street-Car Line's Supplementary Bus Fleet, Top; Off for the Sunny South, Center, and a Log Carrier Traveling a Woods Road

Trouble was met again when nearly a mile of road had to be laid through swampy ground before it would sustain the five-ton cars. Old railroad ties again came to the rescue, the busses hauling them from a supply found four miles away.

RADIO SET BUILT IN BOTTLE IN LESS THAN SEVEN HOURS

With the aid of a few simple tools, an eastern radio enthusiast constructed a receiving set inside an empty bottle and successfully brought in concerts from near-by stations. He found it necessary to make almost all the parts himself.

Suggestion for Disposal of Empty Bottles; Use Them for Radio Cabinets as This Fan Did with Little Work

WATER SOLD TO GOLD MINERS AT THREE CENTS A GALLON

Next to the precious metal sought during a recent gold rush at Gilbert, Nev., water was about the most-valued commodity. While their companions were seeking wealth in ore, enterprising teamsters obtained large steel tanks from a distant city, filled them from springs miles away from the camp and sold the liquid at three cents a gallon. Like other gold rushes, this one led into arid regions far from the railway. The strike was made in what was known as a silver country where gold was not expected. The vein was discovered while a prospector was pecking away at a cropping of rock and struck a gopher hole. The little animal's burrow led him to the ore. Almost overnight, tents were pitched on each side of a barren stretch of sagebrush, which soon became the main street of a bustling town.

Where Water Is Turned into Gold to Supply Boom Town Residents at Gilbert, Nevada

DECAY IN OLD STAINED GLASS TRACED TO PLANTS

According to English experts, the valuable old stained glass in York Minster, Eng., is decaying because it is "tired." For several years, the minute holes have been deepening with the result that the glass is flaking and becoming as thin as tissue paper so that it crumbles almost at a touch. The condition is attributed to two causes, using badly mixed glass and the action of minute plants of which there are twenty varieties. It has been found that most bright colors decay more readily than the gray tones, while the golden yellow is almost immune.

AUTO STOPPED BY STATIC STARTED WITH CHAINS

Autoists stranded in a static belt on a highway near Akron, Colo., during a severe windstorm were delivered from their difficulty when a mechanic, sent to tow them in, by accident allowed a mud chain to dangle from the end gate of his car to the ground. His motor, which also had been halted, suddenly started and other drivers were able to get out of the "enchanted" area by attaching skid chains to rear axles and allowing them to drag. Fine particles of sand carried by the wind and charged with electricity, had communicated the current to the automobiles to such an extent that the batteries in the cars would not function as the area to which they were grounded became charged. The metal chain, making a connection to the earth, soon drained off the superfluous current, restoring the action of the batteries to normal. Cars equipped with magnetos passed through the area without difficulty.

TORCHES ON ST. PETER'S REVEAL DOME'S BEAUTY

St. Peter's Illuminated for the Canonization Ceremonies in Rome; According to Custom, Tallow Torches and Lanterns, Lighted by Hand, Were Used Instead of Electric Lights

Thousands of persons, thronging St. Peter's square during the canonization ceremonies in Rome, saw the cathedral in unusual splendor when 5,000 tallow torches and lanterns outlined dome and pillars in mellow radiance at nightfall. The illumination was the first of its kind in fifty-five years. Three hundred men were engaged several days before the display, clambering about the huge structure to a height of almost 500 feet above the street, adjusting the lanterns. The work was directed by the few remaining men who had charge of the task before 1870 and to whom the assignment was an inheritance. On the night of the lighting, hundreds of workers scaled the sloping sides of the dome at a given signal and the flickering beacons they left in their wake soon bathed the entire edifice in a silvery blanket of brilliance.

ELECTRIC HAND STACKS BRICK; DOES TWELVE MEN'S WORK

Electricity has entered the manufacture of brick with a stacker that is said to do the work of a dozen men. It is equipped with rows of grippers that seize the bricks as they come from the mixers and deposit them at even spaces on a truck ready for the kilns. The apparatus is actuated by five electric motors.

DOUBLE TUBE FOR TOOTHPASTE HOLDS TWO MIXTURES

A collapsible tube for dental or toilet preparations with two separate compartments has been patented to hold different mixtures for morning and night treatments. By keeping the solutions in the same package, the materials may be handled without risk of becoming lost or mistaken for other medicines. Because of its compactness, the container can be conveniently carried while traveling and reduces the cost of fillers. The tube is fitted with a ring for suspending the package where it can be readily seen and reached by the user.

Strange Craft That Ply World's Waters

Fleet of "Pow Pows," Handmade Outrigger Canoes Samoans Use for Fishing and Safe Travel, Even in Heavy Seas

Mesopotamian Narrow Boat Propelled by Two Poles; Below, Air-Motor Craft for Shallow Waters

Bagdad's Favorite River Ferry Is the "Dishpan," Made of Skins over Reeds

Upper Photo Copyright, Underwood & Underwood

Far from the Centers of Civilization

Primitive Dugout Shaped from Log, and a Typical Chinese Junk, a Kind of Clumsy but Sturdy Vessel Oriental Navigators Have Sailed for Centuries

Fishing with Aid of Cormorants from Small Chinese Boat, and a Sailing Gondola in Portuguese Wine Trade

Three Lower Photos Copyright, Underwood & Underwood

HOTEL ON WHEELS GIVES VIEW OF DESERT WONDERS

Glimpses of Motor-Bus Hotel; Corner of Living Room with Chest of Drawers; How Bunks Are Made Up at Night, and Dining Room

Tourists may now enjoy the beauties of the Grand Canyon, the Arizona deserts and the benefits of outdoor life, without the discomforts of makeshift camping equipment, in motor busses fitted as small hotels. They provide a living room, bathroom with all conveniences including a shower, and kitchen with range, sink and refrigerator, besides comfortable sleeping quarters in the form of four berths that fold up on the sides and top of the bus during the day. Such comforts as writing and vanity tables, mirrors, wardrobes, phonographs, carpeted floors and radio are provided and there are altitude and grade meters that may be consulted by the travelers as well as the driver who has a special compartment in front. A gasoline-burning generator supplies current for the refrigerator as well as for

the pressure pumps for hot and cold water, electric lights and fans, heating plant, toaster, percolator and vacuum cleaner. Trips of thirty days are scheduled and a companion car, bearing supplies, carries a guide, mechanic and chef.

COLOR OF HAY IS MEASURED TO DETERMINE QUALITY

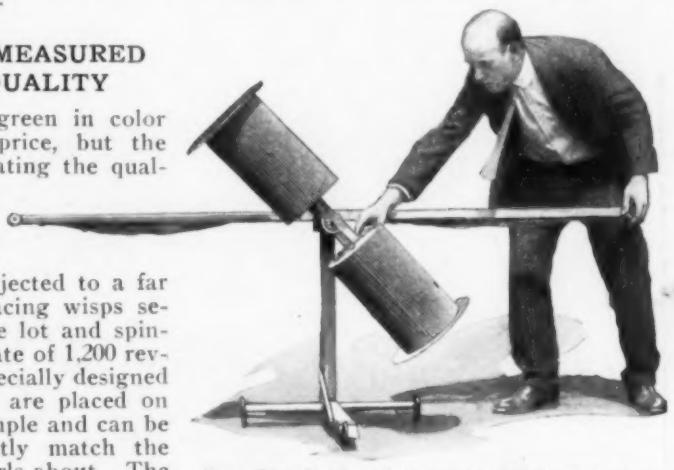
Hay that is a natural green in color usually brings the best price, but the common method of estimating the quality in this way by the eye alone is unsatisfactory and frequently incorrect. Alfalfa, timothy and other kinds of hay now are subjected to a far more accurate test by placing wisps selected at random from the lot and spinning them around at the rate of 1,200 revolutions per minute in a specially designed apparatus. Colored disks are placed on the same axle with the sample and can be adjusted until they exactly match the shade of the hay as it whirls about. The color of any lot can thus be measured accurately.

ELEMENT SENSITIVE TO LIGHT FIREPROOFS WIRES

Selenium, the non-metallic element discovered in rare earths and the chemical first cousin of sulphur, is proving useful in the electrical industry for fireproofing wires. Until recently, its chief service has been its extreme sensitiveness to light. This property has been adapted to sorting cigars, detecting spoiled fruit and to other purposes. Late research has found that, although the substance is combustible, a pound of it will fireproof nearly a mile of rubber-covered copper wire. If a single wire is treated with selenium and twisted into a cable with two other strands that have not received the application, the entire cable is made completely fireproof. The process is adapted either to the inside rubber insulation or to the outside shield of braided cotton, and the material is used in the form of a powder, which is mixed with an adhesive to make it stick.

ROTOR PROPELLERS FOR PLANE GIVE MORE POWER

Two cylinders, taking the place of the usual blades, are employed in an airplane propeller demonstrated recently. The working principle is said to be similar to that which propels the German rotor ship. The propeller revolves with the engine shaft in the usual way, but the cylinders are also turned, in opposite directions, through gears. It is said to have fifty per cent more propelling power than the present bladed type.

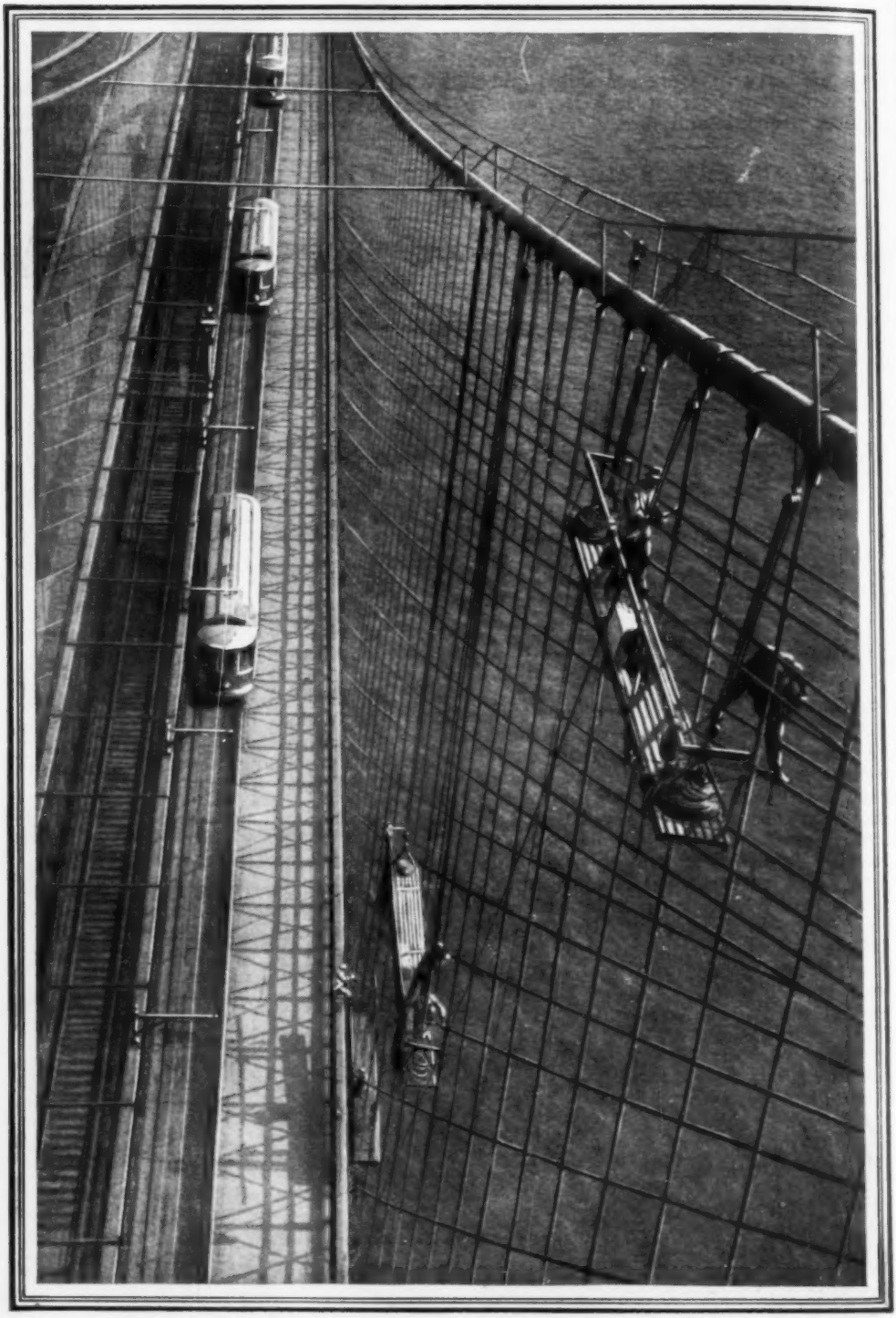


Rotor Propeller for Airplanes; the Cylinders Revolve as Well as the Shaft

TAG ADDRESSER RUN BY HAND PREVENTS SHIPPING ERRORS

Tags are addressed quickly and legibly on a hand-operated stencil arrangement that is capable of doing the work of several typists in little time. The impressions are made from a typed original inserted in a holder and inked by a hand roller. Labels are pulled through the printing space from a reel. Where several shipments are to be made to the same person, the addresser is of special service and new names are easily stamped by changing the stencil. Clearly printed, the tag is more easily read than those written by hand.

Tag Addresser in Operation, Names Being Printed in Duplicate as Crank Is Turned



Painters at Work Preserving the Cables of the Forty-Year-Old Brooklyn Bridge; Note the Handrails for Inspectors Who Daily Walk the Big Cables Looking for Weak Spots

Swinging the Roadway into Place for the New Suspension Bridge Which Is to Link up Philadelphia with Camden, N. J., the Latest of the Great Bridges of the United States

Spinning Webs of Steel for Bridges

"Spider" Wheel, Trundling Back and Forth, Weaves Tiny Wires into Giant Cables to Carry Traffic Streams across Rivers

FROM nickel-steel wire, smaller in diameter than a lead pencil, two giant cables have been spun high in the air between Philadelphia and Camden to carry the latest of the world's great suspension bridges. Twenty-five thousand miles of the wire, weighing 7,100 tons, is being unwound from drums on the Philadelphia shore and carried back and forth across the river by a traveling spinning wheel, called by the bridge builders, appropriately enough, the "spider."

When the two cables were completed, each was 3,550 feet in length and contained 18,666 separate wires, assembled into sixty-one strands. Although the wire-cable suspension bridge owes its discovery to John A. Roebling, the inventor of the wire rope, the bridge cables are never twisted, as in rope. Instead the end of a reel of wire is anchored at one end, and the spider, traveling on an overhead trolley, starts across the river with the bight. On the other side the loop is made fast, and the spider trundles back to pick up another loop and carry it across, continuing to stretch two wires at a time until a strand is completed, when it is bound at intervals with short lengths of wire to keep it round and firm. The process is continued until, as in the Philadelphia-Camden bridge, sixty-one strands were completed for each cable.

Powerful presses then compact the assembled strands into a round cable, which is clamped into shape, while the looped ends of each strand, attached to eyebolts, are anchored in a concrete base far down in the solid rock on shore.

The beauty and symmetrical appearance of a suspension bridge, of which the Brooklyn structure remains the greatest example, despite its age, lies in the graceful curve of the huge cables, dipping down from one tall tower toward the center of the river, then rising again to pass over the supporting tower on the opposite shore. The simplest curve in nature, the catenary, is that formed by a hanging cord. When the cord supports a uniform horizontal load, as in a suspension bridge, it changes its shape somewhat, and approximates a parabola, but the change is so slight, and so skillfully disguised by bridge designers that the eye fails to see it.

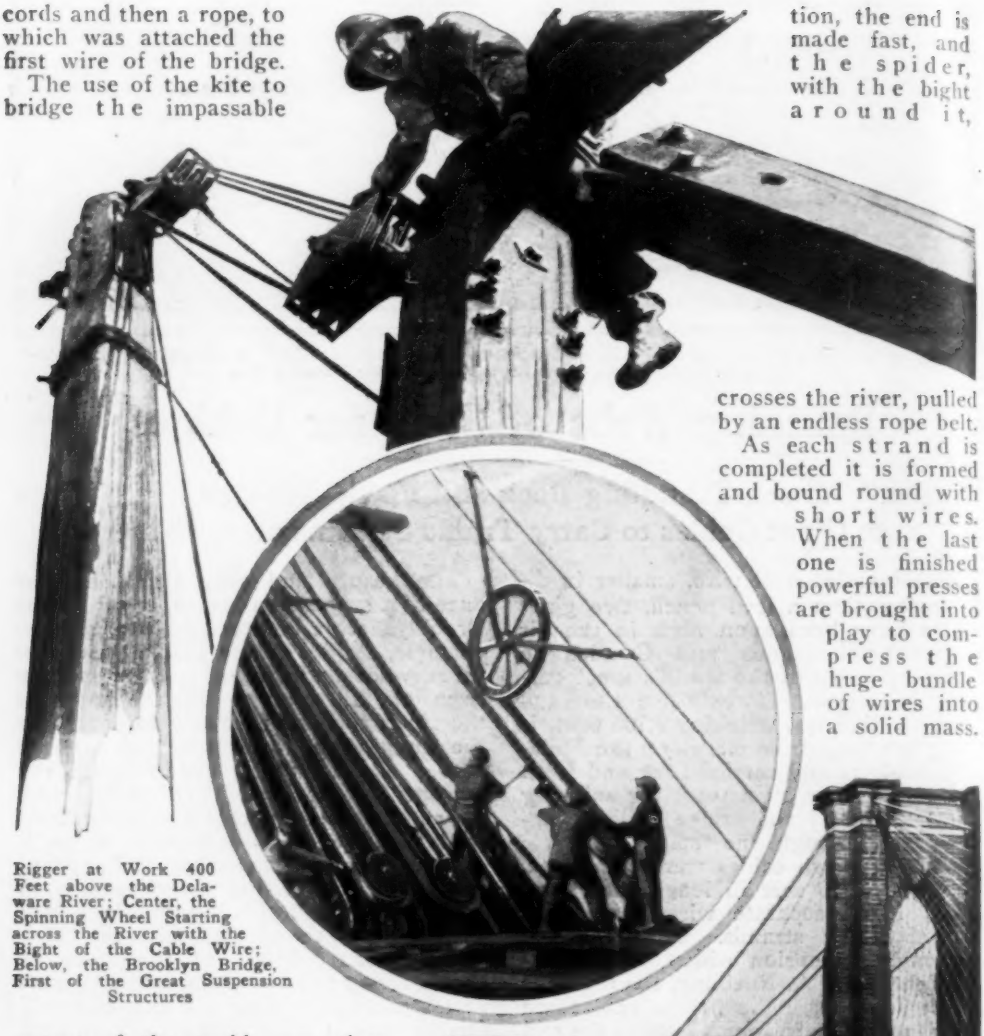
Suspension bridges, in the form of simple rope or chain cables, spanning narrow streams, are very ancient, and still farther back in prehistoric times men used tough but flexible vines, swinging across them hand over hand. Suspension bridges with cables formed of flat iron links joined together by iron pins were developed in England as early as 1814, but the first wire-cable bridge was erected in the United States when Roebling built an aqueduct bridge across the Lackawaxen river at High Falls, N. Y., in 1844, to carry the Pennsylvania canal. Four years before he had invented wire rope and begun its manufacture on his farm in western Pennsylvania.

From farmer and rope inventor to bridge builder he progressed rapidly, and became one of the most famous men of his day, when, in 1852, he flew a kite across the gorge below Niagara Falls and with its string pulled across larger and larger

cords and then a rope, to which was attached the first wire of the bridge.

The use of the kite to bridge the impassable tion, the end is made fast, and the spider, with the bight around it, crosses the river, pulled by an endless rope belt.

As each strand is completed it is formed and bound round with short wires. When the last one is finished powerful presses are brought into play to compress the huge bundle of wires into a solid mass.



Rigger at Work 400 Feet above the Delaware River; Center, the Spinning Wheel Starting across the River with the Bight of the Cable Wire; Below, the Brooklyn Bridge, First of the Great Suspension Structures

waters of the rapids was then unique in bridge annals. Usually the first wires are carried across the stream by boat. The abutments and supporting towers, the latter hundreds of feet high, their height depending on the length of the span, are erected first, then heavy wire-rope cables are stretched between them, and on the cables is erected a wood footpath, assembled on the ground in units of convenient size. Footbridge and cables are braced against swaying, and above the path is erected supports for the trolley on which the spinning wheel runs. The first reel of cable wire then goes into posi-

Bottom Photo © U. & U.

The pressure used is sufficient to squeeze the loosely bound strands out of shape in order to fill every crevice. In the squeezing process the cable is reduced by inches, until it is finally ready for the bands which bind it into permanent shape. Smaller cables to support the roadway are hung from the main wires, and the erecting crew with their derricks begin swinging the beams into place.

Most of the great bridges built in America since the opening of the Brooklyn bridge in 1883 have been of the suspension type. Among the notable exceptions are the Eads steel-arch bridge over the Mississippi at St. Louis, and the cantilever bridge over the St. Lawrence at Quebec. The building of the latter was interrupted when the central span fell as it was being lifted into position, plunging to the river bottom and car-

Painter on the Firth of Forth Bridge, Top; Center, Placing the Temporary Footwalk for the Delaware Bridge, and Left, Clamping a Completed Cable

rying many workmen to death. The proposed bridge over the Golden Gate at San Francisco, estimated to cost $17,000,000, will mark a departure in the combination of both cantilever and suspension features. Two cantilever sections will be linked by a suspension span, 4,000 feet in length and 200 feet above the water level. The proposed Hudson river bridge between New York and Weehawken, N. J., will have a central span 3,200 feet long, with cables supported from towers 780 feet high.

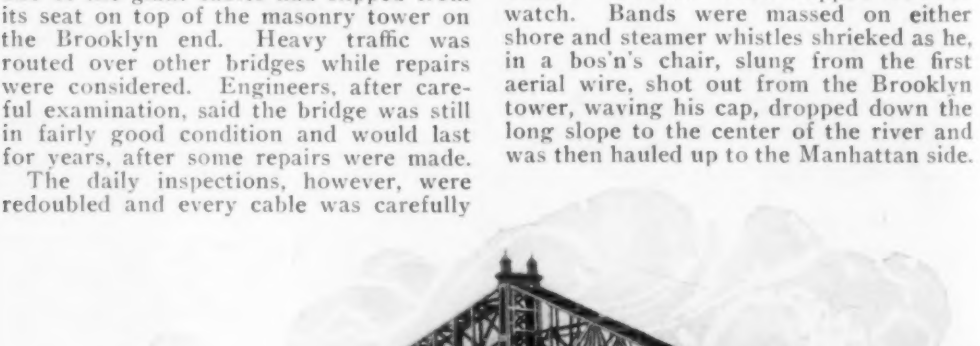
After a huge steel bridge is completed it requires constant inspection and upkeep. Inspectors walk the huge cables of the Brooklyn bridge every day, far above the traffic lanes below, to watch for possible defects, while the work of painting the steel to protect it from rust goes on almost continuously. The great Firth of Forth bridge in Scotland, the greatest cantilever structure ever built, is always in the hands of the painters. It takes three years to paint it from one shore to the other, and then the crew must go back and start over again.

How the life of a suspension bridge compares with that of a compression type, cantilever or otherwise, where the load is distributed to compress huge steel trusses, has not been determined. The Brooklyn bridge is forty years old, but a few months ago it was discovered that one of the giant cables had slipped from its seat on top of the masonry tower on the Brooklyn end. Heavy traffic was routed over other bridges while repairs were considered. Engineers, after careful examination, said the bridge was still in fairly good condition and would last for years, after some repairs were made.

The daily inspections, however, were redoubled and every cable was carefully gone over during its annual painting. Two handrails of wire cable are rigged above each of the main cables and daily the inspectors start out from one shore, climb the big incline to the top of the first tower, trot down the long sweep to the center of the river, up again to the second tower and then down to shore again. For real exercise the daily walk of a bridge inspector would be hard to equal.

The first suspension bridge built in America, according to all records, antedates the discovery of steel wire by many years. It was a wooden structure erected over the Mohawk river at Schenectady, N. Y., in 1805 to 1808, by Theodore Burr, a brother of Aaron Burr. The bridge was 900 feet long and rested on masonry piers. The cables were built up of two-inch planks of Norway pine, overlapping at the joints so as to make a continuous piece, and when completed were three by four feet thick. The old bridge served for nearly three quarters of a century, finally being torn down in 1873.

Roebling, to whom the modern suspension bridge owes its being, did not live to see his greatest creation, the Brooklyn bridge, completed. His son Col. Washington Roebling, carried on the work. It took six and one-half years to erect the great masonry towers and approaches. In 1876, the first man to cross the river other than by boat was the master mechanic. All New York stopped work to watch. Bands were massed on either shore and steamer whistles shrieked as he, in a bos'n's chair, slung from the first aerial wire, shot out from the Brooklyn tower, waving his cap, dropped down the long slope to the center of the river and was then hauled up to the Manhattan side.



Proposed Bridge Across the Golden Gate at San Francisco, Combining Cantilever Sections at Either End with a 4,000-Foot Suspension Bridge above the Pacific

RADIO ON FAST TRAIN HAS HEADSET AT EVERY SEAT

Passengers on Parlor Car of Fast Train Enjoying Radio Concert through Individual Headphones at Each Seat; Single-Control Receiver Is Easily Operated by Child

So that passengers might enjoy radio concerts without being disturbed or annoying others with a loud speaker, changes were made in the design of a parlor car so that separate sets of headphones could be used at each chair and practically all the wiring concealed. The ear pieces were plugged in through wall sockets and all receiver wires for the set itself hidden. Improved reception as well as greater convenience resulted from this arrangement and it did not mar the beauty of the car.

SILENT WATERFALL, AGES OLD, FOUND IN ENDLESS CAVERNS

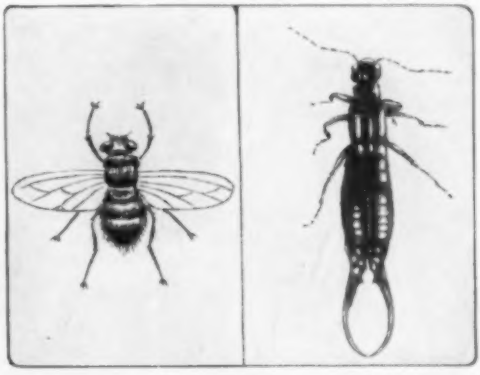
Explorers, feeling their way by candlelight, through the Endless caverns of Virginia, discovered among the many-hued formations etched by a winding subterranean river, a silent waterfall sliding from a cliff fifteen feet high into a deep pool. The cataract, probably millions of years old, had built up a curving surface over the precipice by depositing minerals as it fell. This, and the porous nature of the rock, the scientists decided, explained the absence of noise. Fossils of deep-sea animals that, naturalists believe, lived 500,000,000 years ago, were found in the natural shelves about the pool.

WHERE THE IVORY GOES

Most of the ivory coming to this country in the form of elephant's tusks is used for piano keys. From thirty-seven to forty sets of key plates may be cut from a single large tooth. The smaller teeth are used for billiard balls which must be cut out of the exact center, as the density and weight of ivory vary from there outward, in order that the finished ball may be perfectly balanced.

FLIES THAT EAT BUGS IMPORTED TO SAVE GARDEN PLANTS

To combat the ravages of the earwig, a pest that has played havoc with rose gardens, vegetables and shrubbery on the Pacific coast, Oregon has imported a shipment of tachinid flies, a parasite that destroys the earwig. The flies were gathered in France and shipped in small capsule containers.



At Left, Specimen of Imported Fly to Kill Earwigs Such as Shown at Right

Hothouse on Ocean Steamer Deck Where Fresh Flowers Are Supplied to Passengers Daily

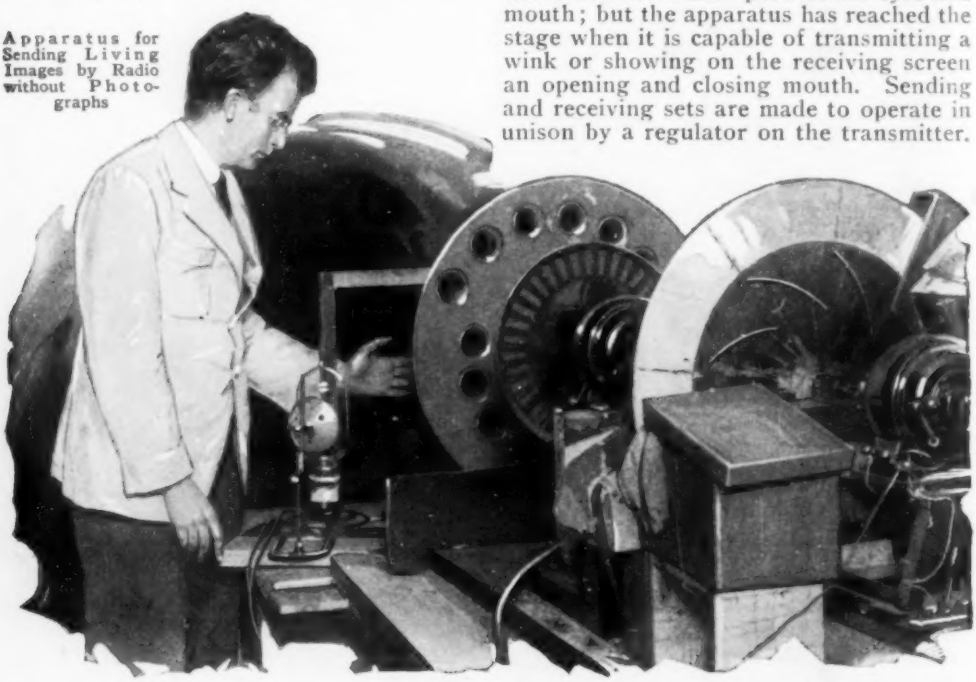
FLOWERS ARE GROWN AT SEA IN SHIP'S HOTHOUSE

Cut flowers are available daily to passengers on the S. S. "Majestic" during ocean voyages. They are cultivated in a small hothouse constructed on one of the decks and are tended by a gardener. Windows in the conservatory are hinged so that they may be opened easily for ventilation and closed tightly in case of cool weather. Ferns and plants for decorating the dining tables also are grown here and flowers are supplied for special occasions.

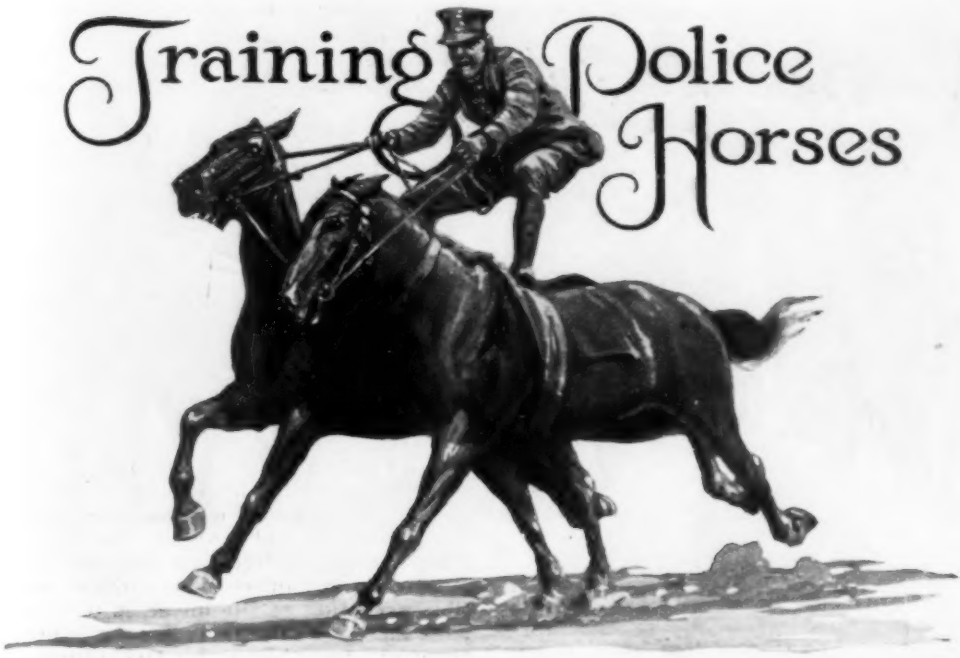
LIVING PICTURES SENT BY RADIO WITHOUT USING FILM

That the time may be near when a man in Chicago talking by radio to New York may also see the person to whom he is speaking, is indicated by the work of an English inventor who has succeeded in sending "living pictures" of faces and moving objects by the aid of the wireless. The apparatus does not depend on photographs but permits the observer at the receiving station to see a transmitted living and moving image. Lenses whirling around on a disk focus the image to be transmitted on a light-sensitive cell which varies its resistance according to the intensity of the light passing through it. This interrupted light causes a pulsating current to be transmitted through an aerial to the receiving station, where it is amplified and lights a lamp behind another revolving disk, the image being thrown on a ground-glass screen in a series of fine strips of varying light and shade. A hand reproduced appears as a blurred outline; a man's face, looking at the transmitter, is reproduced on the receiving screen as a white oval with dark patches for eyes and mouth; but the apparatus has reached the stage when it is capable of transmitting a wink or showing on the receiving screen an opening and closing mouth. Sending and receiving sets are made to operate in unison by a regulator on the transmitter.

Apparatus for Sending Living Images by Radio without Photographs



Training Police Horses



BESIDES the race track, there is another field where the horse seems sure of a permanent position despite the constantly increasing numbers of motor cars. This is the congested city, where no satisfactory substitute has been found for the mounted policeman in keeping the traffic moving at crucial times and enforcing the parking regulations.

Astride his steed, the patrolman can see two blocks and more so that he can break up a jam before it has time to grow into a costly snarl and often before the man on foot is aware of its existence. He often can catch a parking violator before the offender leaves his car and can patrol several blocks to the foot policeman's one or two.

On routine duty, one mounted policeman is considered the equivalent of three on foot; in accidents, strikes and riots, and in keeping persons in line at parades and similar occasions, he is held equal to ten men without horses. Not long ago, New York City abolished part of its mounted force, but since, has restored most of it. In Chicago's business district a decrease in motor accidents which have grown in other parts of the city is attributed largely to the mounted squad.

It takes two long years of rigorous education to train a horse so it may be trusted in almost any situation with a reasonably expert rider. From twelve to fifteen years is the usual span of service. Then the traffic horse follows the destiny of his fire-engine cousin who has all but disappeared with the advent of the motor. He is sold into civil life or farmed out to an easy-going buyer in the country.

Within a surprisingly short time, the horses learn to respond correctly to the traffic signals without hint from their riders; when the policemen dismount, they learn how to take care of themselves in the rush of the street and need no watching; they become skilled at charging into a human throng without injuring anyone, and learn how to push persons into line by gently shoving them.

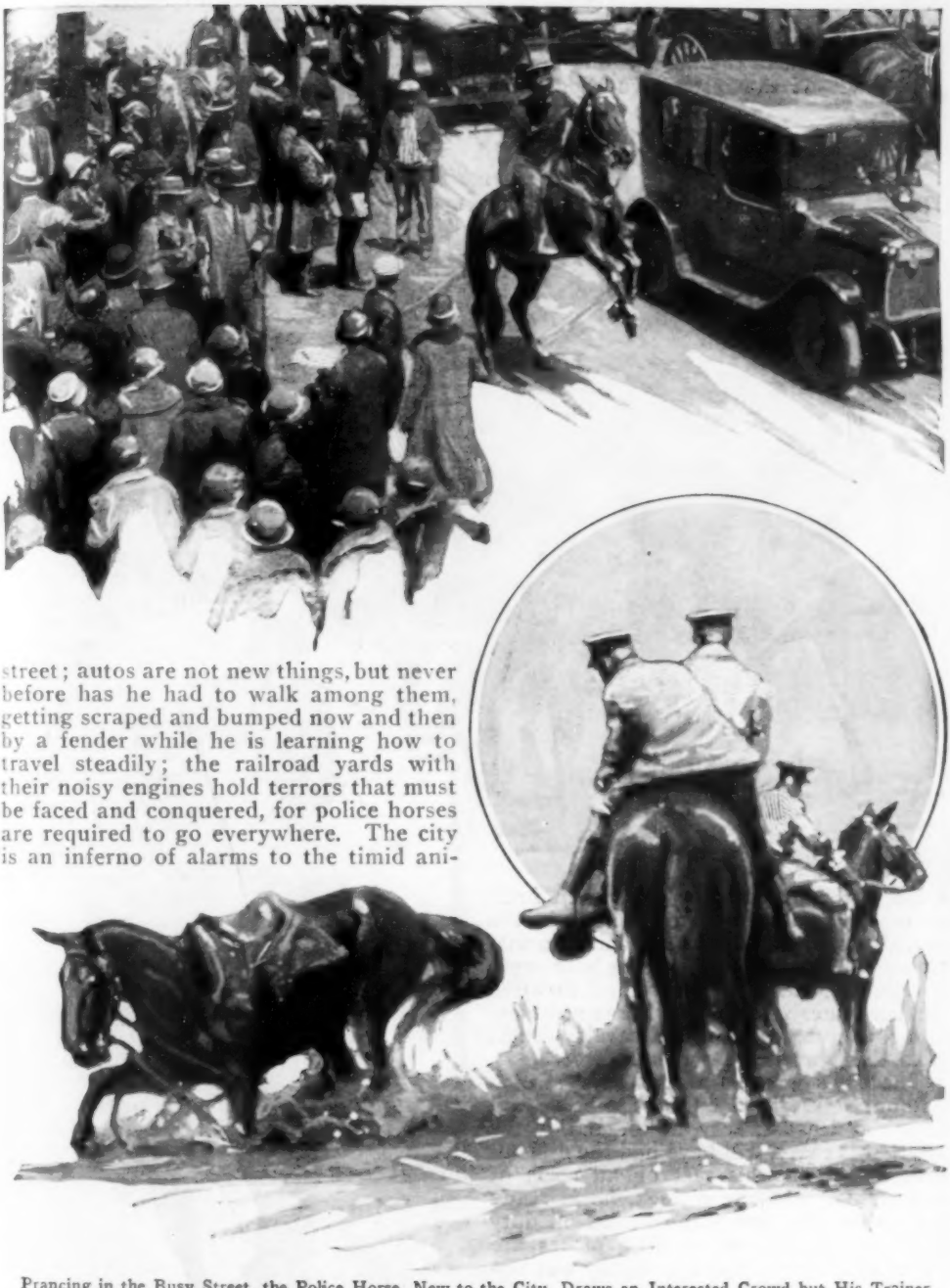
In from the country, where the buyer has obtained the animal for a price that now is around $300, the new horse is kept under ten days' strict quarantine after a thorough examination by a veterinary surgeon. Usually dark bay in color, weighing not much more than 1,100 pounds (heavier horses become fatigued too easily and are too large for the close, quick work of the streets) the animal generally is already broken to the saddle and bridle. The big task is to get him accustomed to city noises and to his particular duties.

After the quarantine, the horse is ready for his first taste of city life. He has been fitted with rubber shoes and has a soft pad, a comfortable army saddle and bridle.

Now appears the training sergeant, who more than any other man, with the possible exception of the buyer, is to determine the horse's destiny. For the training sergeant breaks him to his task, discovers his good and bad points and after three months of thorough testing pronounces the final verdict as to whether the horse will do for traffic work or is to go back to the farm.

High-strung and sensitive, the horse is assailed by flapping papers that suddenly swirl out of gutters and skid across the

Proof of the Excellent Training Police Horses Receive Is Seen in Trick-Riding Exhibitions; Uniform in Size and Color, They Are Specially Suited to Drills Such as the Pyramid Above, Where a Straight Line Must Be Maintained, and to Roman Riding Below, Where Teamwork Is Essential; Center, a Favorite Mount Learning to Rear



Prancing in the Busy Street, the Police Horse, New to the City, Draws an Interested Crowd but His Trainer Calms His Fears; in the Lower Picture, Changing-Mount Drill

street; autos are not new things, but never before has he had to walk among them, getting scraped and bumped now and then by a fender while he is learning how to travel steadily; the railroad yards with their noisy engines hold terrors that must be faced and conquered, for police horses are required to go everywhere. The city is an inferno of alarms to the timid animal, and only his rider's firm but kindly voice and the reassuring pat on the neck, prevent a runaway that would unfit the horse for further duty. Sometimes the animals do amazing things when going through their early training. Not long ago, in Chicago, one became enraged at his own reflection in the glass and charged upon the sidewalk. Before he could be halted, he had plunged through a window.

Three months of this breaking in at two hours or so a day, enable the training

sergeant to measure the horse. All of his peculiar traits are noted and the information passed on to the man who is next to ride him. If the tests have been satisfactory, the probationer joins with forty or more regulars at seven o'clock in the morning and prances in marching formation down to the city where he is to serve a regular beat. This marching involves further education, for the horse must become accustomed to the cavalry bugle calls that govern the squad.

When Policemen Turn Acrobats and Their Horses Catch the Spirit of the Circus Ring: a Double Pyramid Formation with Two Teams of Three Horses Each, and the Two-in-One Emergency Hold

The day's work is a six hours' stretch without rest. In that time the horse will travel at least twenty miles, and if the weather is rainy, will have had the difficult task of keeping his feet on all sorts of pavements. By one o'clock, he is ready for the relief squad that remains on duty until six o'clock, when their places are taken by the third shift that stay out until after the theater hours.

In addition to their regular routine, horses and men engage in drills a certain number of hours throughout a training season, and the men attend a school of instruction one hour each week, where they learn how to handle the public under various situations and to present cases in court.

ELECTRIC COAL TOWERS EQUAL MANY THOUSAND MEN

When operated at maximum capacity, two electric coal hoists installed at a New York power house are said to be capable of doing daily the work of 23,000 men. Together, the towers can lift 6,000 tons of coal 200 feet above the street level every twenty-four hours. The fuel is taken from great barges. From long steel arms, giant scoops drop down and their jaws, at each mouthful, bite out a two and one-half ton load, swing it aloft and dump it into the hoppers that feed the furnaces. Each round trip of the scoop requires but thirty-six seconds. Only one man is needed to operate each tower.

HUNDRED BOLTS OF LIGHTNING FLASH EVERY SECOND

According to a London weather-bureau report, there are about 1,800 thunderstorms in progress every minute throughout the world, giving 360,000 lightning flashes an hour or 100 every second. Observations made from 3,000 stations, indicate that the earth experiences 16,000,000 storms of this character each year, about 44,000 daily. At certain posts in tropical countries, during the rainy seasons, distant thunder is such a common occurrence that the observer frequently forgets to enter it in his register.

TESTER TELLS AIR HUMIDITY AND RATE OF MOTION

As an aid to healthful conditions in rooms, a unique tester indicates both the humidity and motion of the air. It somewhat resembles a lizard or a gargoyle, and has a protruding tongue in the form of a small glass tube along which a drop of red fluid is continually sucked in and dropped back to the base of the glass. The rapidity of this action shows if the air is dry, moist or stirring, since the motion is caused partly by the rate of evaporation of water which is first poured into the hollow body of the figure and saturates the head. One filling will keep the gauge in operation night and day for a week. A chart shows how many strokes per minute the tester should make for health at different temperatures.

Air Tester in Operating Position, Bubble Flowing up and down Glass Tube

TEAR GAS RELEASED BY TOUCH OF CASHIER'S FINGER

A system of bank protection by which tear gas is released in blinding clouds from nozzles placed over the cashier's window at the mere touch of a button, has been devised. It was demonstrated recently in an exhibition raid staged before a group of bankers and business men.

Cashier's Upraised Hand Presses Button, Releasing Tear Gas from Receptacle above Window

KILL DISEASE BY DISEASE

That paralysis may be cured by infecting the sufferer with malaria fever was the belief expressed at a recent medical convention. The treatment, in which one disease is made to cure another, is said to have been tried with success. Blood taken from a malaria patient is injected into the veins of the paralytic who then has attacks of high fever. After eight or ten of these attacks, the patient is given quinine to kill the malaria germs which killed the paralysis bacilli.

WHEEL ATTACHED TO GOLF BAG SAVES HIRING CADDY

Players can carry their own golf clubs with little difficulty, saving the services of a caddy, by attaching a small, patented,

Wheel Adjusted to Golf Bag for Easy Trundling around Course without Need of Caddy

rubber-tired wheel to the bottom of the bag and trailing the container about the course. The wheel is easily put on, prevents damage both to the bags and to the greens and may also be adapted for carrying hand baggage.

SAILING SHIP IS STILL QUEEN OF SEA IN SALMON TRADE

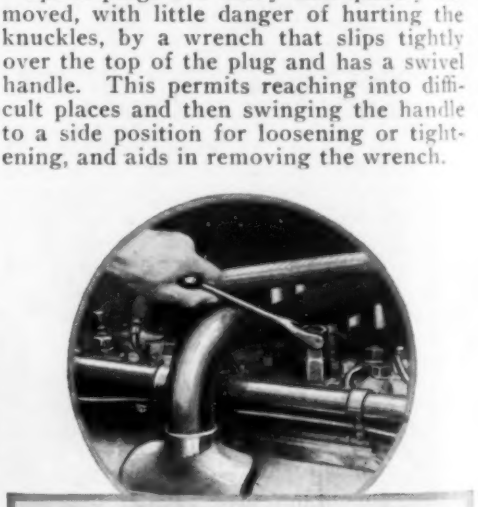
Steam and motors have all but banished the sailing vessel from the sea, yet in a fleet of twenty-five square-rigged ships in service in the Pacific salmon trade, many of the old traditions are being kept alive. In winter, the boats are docked together in a cluster of yards and lofty masts near Oakland, Calif. Every spring, twenty of them sail out through the Golden Gate, Alaska-bound, for the salmon run, leaving five in the harbor for emergency use. The crews are a versatile lot of seamen-fishermen. On the voyage up, which takes about a month, with the cargoes of tinplate and boxes for packing the fish, they man the ships, but as soon as Alaskan waters are reached, all but the skipper and the cook go ashore to work in the canneries for sixty to ninety days, the duration of the average season. By the latter part of August, the cases of tinned salmon are loaded into the holds and the fleet of windjammers is off to the south again. Because of the limited season, it is not considered practical to maintain steamers for this service, hence it is predicted that this fleet of sailing vessels will be in use for several years to come.

SPECIAL MAPS FOR AVIATORS AID HIGHER SPEED

Special maps have been devised with the aid of the geological survey for the use of airmen. They are cut in narrow strips and usually depict an area not over one hundred miles wide. Besides the emergency landing fields, they show the form of a city as it appears from the air, improved roads, altitudes of different sections in colors, bodies of water, curves of railways, crossroads and other data. Before this type was designed, the aviator took an ordinary map, drew a line in the direction of his proposed route and interpreted the symbols as best he could. The new guides emphasize the features of most importance to the pilot.

SWIVEL SPARK-PLUG WRENCH SAVES THE KNUCKLES

Spark plugs are easily and quickly removed, with little danger of hurting the knuckles, by a wrench that slips tightly over the top of the plug and has a swivel handle. This permits reaching into difficult places and then swinging the handle to a side position for loosening or tightening, and aids in removing the wrench.



Spark-Plug Wrench in Use and Close View Showing Attachment of Swivel Handle

HIGH above the earth, up where tomorrow's weather is being made, scientists are searching in hope of finding the clue to next month's storms or sunshine. Through delicate instruments sent up attached to sounding balloons, carried in airplanes or stationed in observatories on mountain tops and in parched deserts the answer to the relation of sun spots to the earth's weather is being sought.

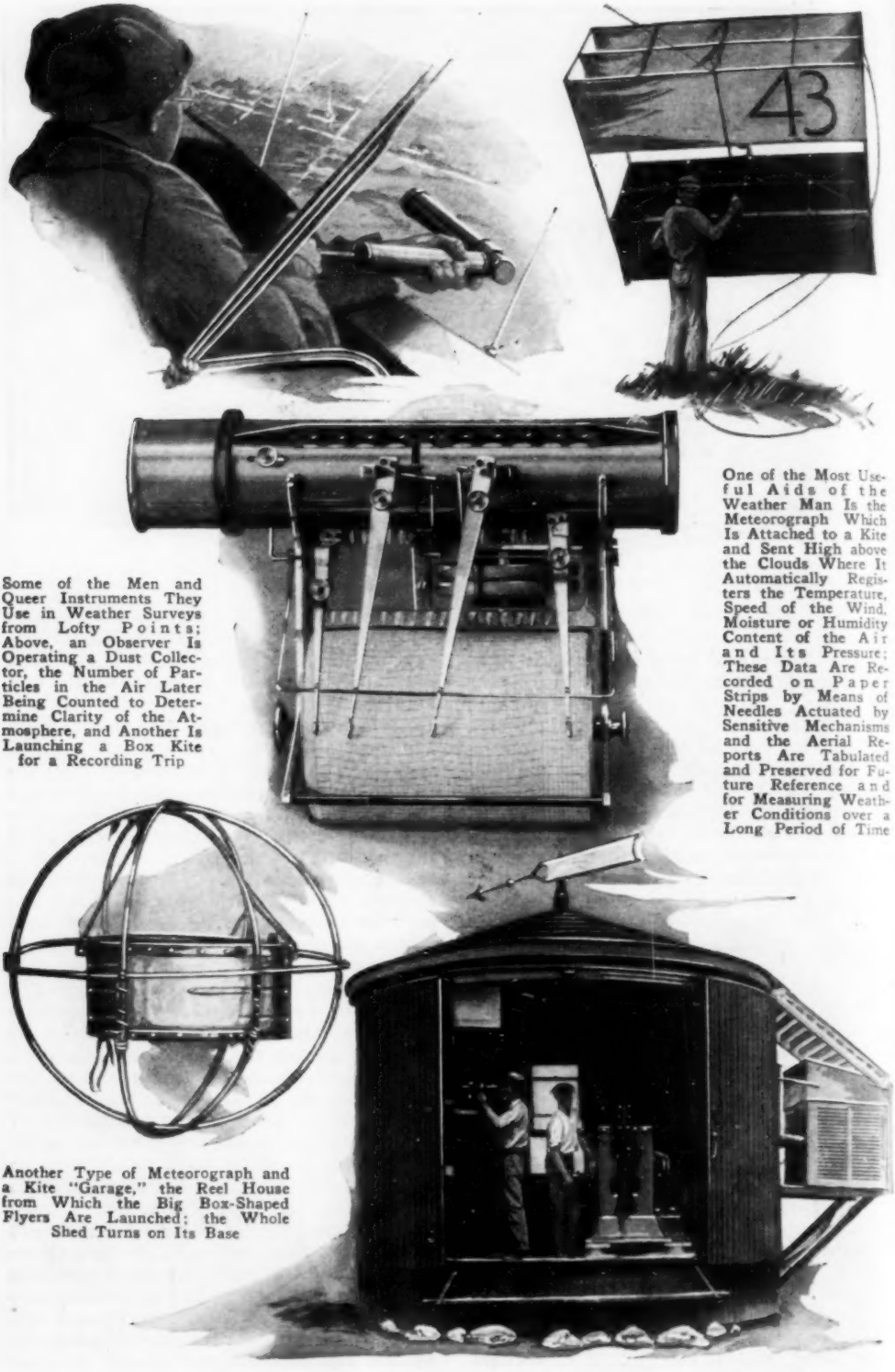
The United States weather bureau at present makes tentative forecasts for a week in advance, but there is hope that further checking of phenomena already observed may make it possible to predict a month or more ahead. The basis of the investigation is the known fact that spots observed on the sun are connected with changes in the amount of heat reaching the earth, and that either the spots, the variations in heat, or both, in some manner control storms and bring wet or dry years.

The Smithsonian Institution for some time has maintained solar observatories on a mountain top in Chile and on the desert in Arizona and, on the strength of information gathered there, has enlisted other agencies in a world-wide string of sun-measuring stations.

The weather bureau has established automatic recording sun-heat measurers at the University of Chicago, in Central Park, New York City, Madison, Wis., Lincoln, Nebr., and Washington, D.C. Others are being set up in Samoa and southern equatorial Africa, and Dr. Ladislaus Gorcynski, Polish weather observer, made a special trip to this country to have a similar instrument standardized with the American ones so that he can place it in the Sahara desert.

While the world-wide investigation into the amount of the sun's heat which reaches earth is getting under way, the weather bureau is conducting a parallel inquiry into the effect of dust particles in the air on the earth's weather. Dust in suspension in the atmosphere has an important bearing on the amount of heat which reaches the farmer's growing crops, and the amount of light which reaches city workers. Dust catchers sent into the upper air by balloon or airplane take samples of the air and deposit the dirt on sensitive plates to be counted under a powerful microscope. An average smoky day in Chicago has yielded as high as 7,180 dirt particles to one cubic centimeter of air, a space not much larger than a quarter-of-an-inch cube. In Washington, an exceptionally smoky day gave up but 6,046 particles to the cubic centimeter.

Dirt sucked up by the wind may affect the weather for hundreds, or even thousands of miles around, since the particles remain in suspension in the atmosphere for considerable time. Several years ago a volcanic eruption in the islands off Alaska was followed for several days by



Some of the Men and Queer Instruments They Use in Weather Surveys from Lofty Points; Above, an Observer Is Operating a Dust Collector, the Number of Particles in the Air Later Being Counted to Determine Clarity of the Atmosphere, and Another Is Launching a Box Kite for a Recording Trip

One of the Most Useful Aids of the Weather Man Is the Meteorograph Which Is Attached to a Kite and Sent High above the Clouds Where It Automatically Registers the Temperature, Speed of the Wind, Moisture or Humidity Content of the Air and Its Pressure; These Data Are Recorded on Paper Strips by Means of Needles Actuated by Sensitive Mechanisms and the Aerial Reports Are Tabulated and Preserved for Future Reference and for Measuring Weather Conditions over a Long Period of Time

Another Type of Meteorograph and a Kite "Garage," the Reel House from Which the Big Box-Shaped Flyers Are Launched; the Whole Shed Turns on Its Base

a gray, dull sky over a large part of the United States, while the dust particles fell in layers in the western states. Freak mud rains are reported nearly every year in some part of the country, the phenomenon being due to a windstorm in one section scooping up vast amounts of dust, which finally combines with a rainstorm and falls to earth as mud. The reaches of the upper air, where these dust clouds travel, are also one of the traveling vehicles in the spread of weeds and plants. Dust samples taken at the 10,000-foot level have yielded plant pollen which may travel hundreds of miles before coming down to earth again.

Tying Recording Instruments to Pair of Weather Balloons for Observation Trip at Desert Post

In its weather researches far above the earth the weather bureau is developing and using many strange instruments, not the least of which is the meteorograph, a little six and three-quarter ounce mechanical aviator. The device is an automatic recording instrument which registers atmospheric pressure, temperature and relative humidity. It is capable of rising to a height of twenty-two miles before the gas in its small balloon, expanding in the rarefied atmosphere, causes the bag to burst. As the instrument starts to drop, a small parachute opens out and pilots it safely back to earth, a wicker basket of three rattan hoops protecting it against damage. Attached to the outfit is a card giving directions for mailing it to the weather bureau, and a small reward is paid the finder. Because of the intense cold miles above the earth—the instruments have registered as low as 122 degrees below zero—ink cannot be used to make the records. Instead an aluminum sheet is treated with gum camphor and then coated with soot. On this coating a steel point traces the results of the trip.

In addition to the high-altitude investigations, made with free balloons, meteorographs are sent up daily attached to kites, several observatories co-operating chiefly to prepare the weather maps issued for aviators, showing conditions at various altitudes. Box kites have been used by the bureau since 1890 in these altitude studies. The kites are about seven by three feet in size, the cotton covering being mounted on a light spruce framework. Piano steel wire of high tensile strength is used instead of a cord, the drums from which it is fed holding from eight to ten miles of wire. The kite reel is operated by a variable-speed motor, housed in a small circular building mounted on a turntable so that the kite can be flown in any direction the wind may take. These kite stations are maintained by the government at Allendale, N. Dak., Drexel, Nebr., Broken Arrow, Okla., Groesbeck, Tex., Due West, S. C., and Washington, D. C., and others are to be established in from 75 to 150 localities in all parts of the country. When there is no wind to fly the kite, the station falls back on a pilot or sounding balloon, while at various army stations planes are sent up to make observations.

The sounding balloons are filled to a diameter of thirty inches and then set free, ascending at a rate of from 600 to 800 feet per minute. As they go up their action is observed through a theodolite, or modified surveyor's transit, in order to check the rate of their drift, as well as the direction, at various levels. Slightly larger balloons, or two of the smaller ones, may be fastened together to carry recording instruments, and then pulled back to earth like the kite. Cloud information is also being gathered by the bureau by sending observers in planes to ride through the cloud banks, a dangerous task when they are extremely thick or close to the earth. The highest clouds, consisting of ice needles, are from five to ten miles above the ground.

The upper-air investigations have disclosed many interesting things, one of which is that the temperature does not always decrease as higher levels are reached. Frequently on very cold mornings it is warmer a few hundred feet in the air than it is on the ground. On the average, however, there is a drop in temperature of one degree Fahrenheit for every 300 feet of altitude. Up until about thirty years ago it was believed that this decrease continued to the limits of the outer atmosphere, but modern investigation has disclosed that it holds good up to only six or eight miles above the earth, beyond which point there is practically no change in temperature.

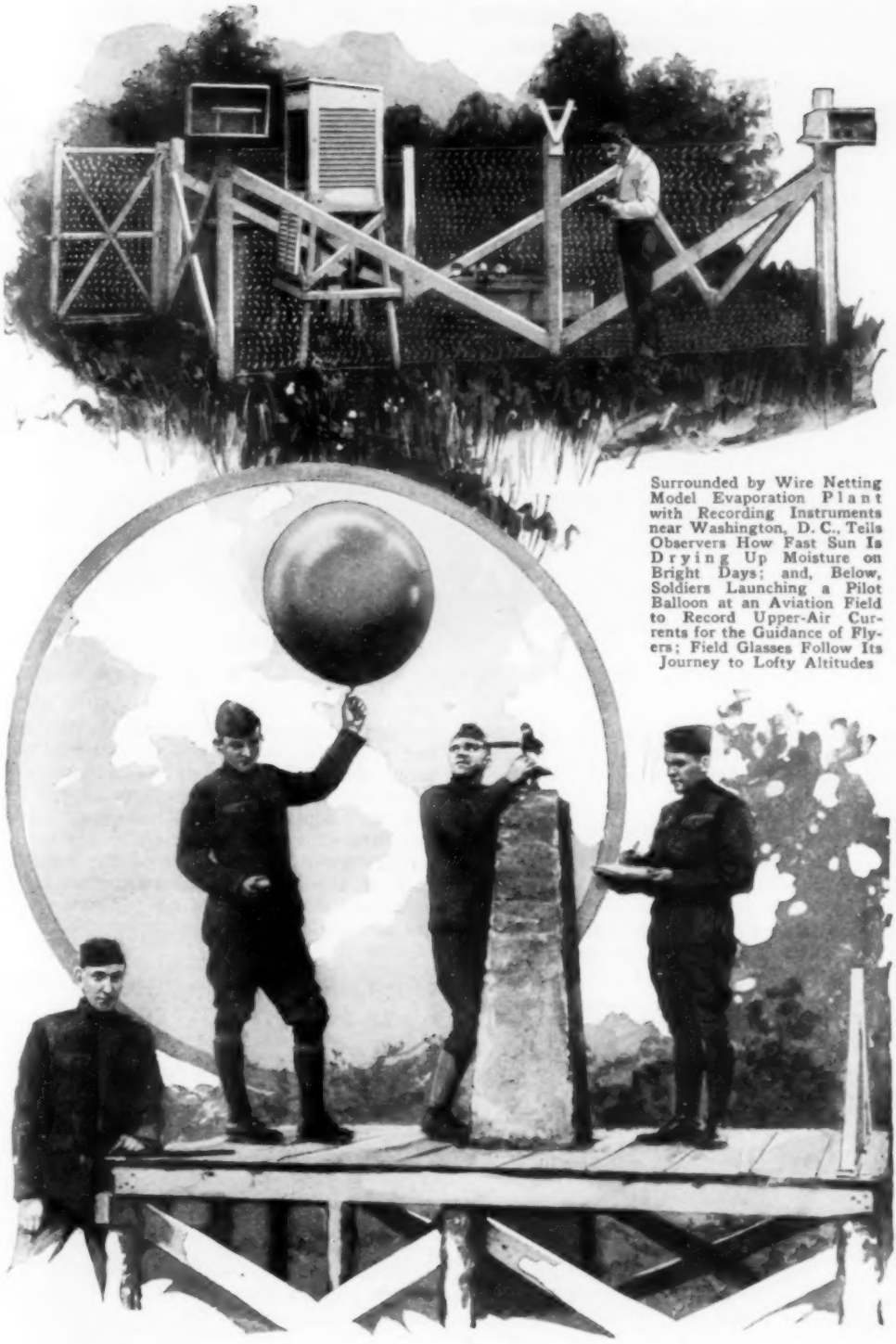
The weather bureau has found also that the general rule that the wind blows twice as hard a half mile above the earth as it does on the surface is frequently broken. During summer months conditions have been found under which there is virtually no wind for four or five miles above the earth, while on the other hand velocities of eighty to one hundred miles an hour have been charted just above the surface in winter, and on one occasion a wind blowing at the rate of 185 miles an hour was recorded.

While the bureau is busy developing still more scientific ways of forecasting the weather, its experts admit that for home weather prophets the homely old weather rhymes cannot be beat. The explanation of the success of the weather rhymsters, however, is entirely scientific. Take the rainbow for example; seen in the late afternoon, according to the old proverb, it means fair weather on the morrow, while seen in the morning, it means rain to come. The reason, according to the weather scientists, lies in the fact that the prevailing winds in the middle latitudes blow from west to east, and hence storms move in the same direction. As the rainbow is only seen when looking away from the sun, an afternoon rainbow, with the sun sinking in the west, is seen in the east, and means that the rain mist which makes it has passed over and is moving on to the east of the observer, so that he is through with that particular storm. A morning rainbow, on the other hand, is seen in the west, and hence heralds an approaching shower.

If you want to do your own weather predicting, rainbows, clouds, smoke and other everyday things can give you a general idea of the same information which the scientific weather instruments gather in precise detail when they are sent up by balloon, airplane or kite. Smoke which rises in a thick column and sticks together for some time, dissipating slowly, is full of moisture, and is likely a sign of rain, whereas dry smoke spreads quickly and disappears.

One of the oldest weather proverbs deals with the red setting sun as a forewarner of rain the next day. The proverb is based on fact, but it is not the sun that is red but moisture in the air which makes the light from the sun appear to be red.

Camera Studies Are Made from Mountain Summits of Different Types of Clouds, of Watersheds, the Effect of Rains and How Timber Prevents Erosion



Surrounded by Wire Netting Model Evaporation Plant with Recording Instruments near Washington, D. C., Tells Observers How Fast Sun Is Drying Up Moisture on Bright Days; and, Below, Soldiers Launching a Pilot Balloon at an Aviation Field to Record Upper-Air Currents for the Guidance of Flyers; Field Glasses Follow Its Journey to Lofty Altitudes

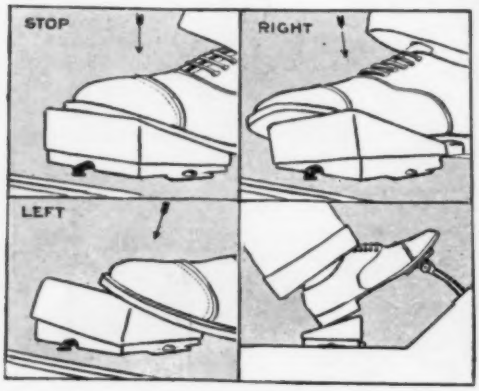
PLANES GATHER MAIL IN FLIGHT FROM ROPE BETWEEN POLES

Mail bags are pulled aboard with a grapple without halting the planes at non-stop points on a German airline. The pouch is attached to a rope suspended between two poles in an open field. The pilot flies between the uprights and as the plane roars past, the anchor, which already has been dropped, catches the cross rope and the pouch, jerked from the ground, is pulled up to the cockpit as the plane soars to higher levels.

Airplane Snatching Mail Bag from Ground While in Flight; Pilot Steers Low, Drops Anchor and as Airplane Passes between Poles, It Catches Rope Tied to Sack

FOOT SWITCH FOR CAR SIGNALS INCREASES AUTO SAFETY

Stop-signal and direction lights are flashed for the guidance of motorists by pressing a foot switch fitted on the bottom of the car so that the driver need not remove his hands from the steering wheel.



Drawings of Switch in Operation While Signaling and How It Is Worked by Heel

It may be operated either by the heel or toe, pressure in the middle turning on the stop light and a turn of the foot, to the right or left, making contacts that light the corresponding signal lamps. The switch is also adapted for opening electric latches on office doors, and for ringing call or alarm bells and buzzers. It is easily installed and has no parts likely to get out of order.

MONKEY HAIR FOR FINGER RINGS IS SUBSTITUTE FOR GOLD

Jeweled rings of monkey hair instead of gold and other metals have been placed on the market by a German inventor. Only the choicest strands are used, usually those from the hind quarters of the animals as they are considered the strongest. After they are cleaned and sorted according to color, they are chewed to test any hairs that might be too brittle. A chemical bath is then given as a preservative, and the strands are finally spun and interwoven so that they will hold the settings and the gems securely.

¶It costs ivory hunters $200 for a license to shoot elephants.

HOW FIRES OF BODY ARE FED SHOWN IN X-RAY MOVIES

How steak, salad, pie and coffee are made into energy in the stomach and what happens in the machinery of a working man during and directly after his dinner hour, have been shown in X-ray motion pictures of the processes of digestion. The human body, fed with food, was compared with an ocean liner fed with coal or oil. The engine room is the heart. The steam is the blood. As shown on the screen, the stomach acted as a sort of mixing vat, reducing food to liquid and propelling it onward in a performance much like an electric washing machine. Muscular activity went on with the regularity of an engine pump. The film showed the fluid pouring over millions of fine projections through which, it was explained, the vital parts of the dissolved food were at this point sent into the blood stream. The picture was then switched to the heart, which was seen at work chugging back and forth, with a little sideways motion, like the big arm of a turbine in a pumping station.

PORTABLE READY-MADE MANTEL COSTS LESS THAN BRICK

Imitation brick mantels in various color combinations and designs are on the market in ready-made units that can be set up in little time and are adapted to gas or electric burners or to installations using coal or wood. They are not as expensive as brick, weigh considerably less and can be chosen to harmonize with a particular scheme of interior decoration. The material used in their construction is artificial stone or imitation brick.

Installing One of the Portable Mantels; Its Surface Closely Resembles Brick and Patterns and Colors Can Be Harmonized with Interiors

HEDGE CLIPPER RUN BY CRANK SAVES WORK WITH SHEARS

Hedges, shrubs and plants are trimmed quickly and evenly with a patented rotating clipper driven by a handle geared to a flexible shaft connection. The head is formed by a steel-toothed plate on which the blade turns. Little skill is required to operate the outfit and greater speed can be accomplished at considerably less effort than with shears. It is also well suited to cutting hedges into fancy shapes. The trimmer is manufactured in Scotland.

Trimming Hedge with Portable Clipper That Does Rapid Work and Reaches Difficult Places

SOUTH AMERICAN TEA FOR U. S.

Efforts are being made by the department of agriculture to popularize the use of the leaves of a species of holly found in North Carolina and Virginia as a substitute for tea. A similar product, known as mate, is consumed at the rate of about 200,000,000 pounds a year in South America for beverage purposes. During the Civil War, the American variety was used to some extent in the south because of the scarcity of tea and coffee. It is said to contain one and six-tenths per cent caffeine, the stimulating drug found in only slightly larger quantities in coffee. A process has been found for removing the leaves with steam and toasting them in ovens.

Typical Stand of California Redwoods, the Result of Centuries of Slow Growth; in Preserving Such Tracts from Ruthless Destruction and in Planting New Ones, Lumbermen Now Are Actively Engaged

Forest Planted Like Wheat

By H. H. DUNN

COVERING the bare hills and valleys of northern California with forests bearing twenty to twenty-five per cent more trees to the acre than did the original groves which carpeted that part of the state, a number of lumber companies have begun the largest reforestation plan ever undertaken.

There is no sentiment in the project, which already has been applied to several thousand acres. It contemplates the cutting of these forests, just as wheat is cut from the field, except that the harvest is thirty to fifty years away, depending on the size of the trees desired. It is calculated that every tree so planted today will yield more profit at the end of the three decades than a twenty-dollar gold piece placed in a savings bank at four-per-cent compound interest for the same period, returning also the principal.

So far, the planting includes mainly redwoods, but the same plan is equally applicable to pine, Douglas fir and other lumber trees, and is of national interest because it is as suitable to the hills of New England, or the cut-over forests of the Great Lakes states as it is to California. Nurseries have been established, the forestry department of the University of California is directing the work, and the lumber companies have united in an association for the express purpose of replanting two to three times the number of redwoods they have cut. So far ahead does the plan look that all preparations have been included to replant these same areas when they, in turn, have been denuded of the trees being planted today, that is to say thirty to fifty years from now.

Seedlings Are Planted in Shallow Holes and Require No Attention Save Protection from Fire

The redwood tree —this article refers to the coast redwood and not to the "big tree" of the Sierra Nevada — is the fastest growing tree in the world according to Donald Bruce, of the University of California, who has found that at sixty years of age the average redwood yields 20,200 cubic feet, or 139,000 board feet per acre,

Felling a Giant Possibly Seven Centuries Old; Tree Is Sawed in Half on Side Opposite to That on Which It Is to Fall and Then Chopped Down

while each tree has a base of 486 square feet. Compared with this, the Norway spruce, one of the fastest growing trees in Europe, yields at the same age only 8,798 cubic feet, with a base of 231 square feet. At thirty years of age, the redwood will yield a trifle more than half the amount noted for sixty years, since the redwood grows at the fastest rate of its life during the first fifty years.

This fact, coupled with comparative ease of reproduction, and a relatively great resistance to fire on the part of the growing redwood, makes this tree one of the most interesting experiments in reforestation as well as one of the most valuable in results. The methods followed in this reforestation project are most interesting, and some idea of its size may be gained from the fact that the total area cut over to be replanted is 561,000 acres, with an added area of brush fields, at lower altitude than the regular redwood cut-over lands, of 165,000 acres, also to be reforested. This gives 726,000 acres, to be covered with redwood seedlings, set about twenty feet apart. The amount of merchantable redwood timber still standing is estimated at seventy billion board feet.

In connection with this it is interesting to note that the forests of the United States still contain 745 billion feet of merchantable timber, which we are cutting at the rate of twenty-five billion feet a year. This means that this stand of timber also will last about thirty years. We are, however, growing about six billion board feet a year in various reforestation projects, which leaves the total drain about nineteen billion feet a year, at which rate the visible supply will be gone in forty years.

But since one acre of redwood fifty years old will produce enough lumber to build seven bungalows of five rooms each, sufficient to house thirty-five persons, at an average cost of $6,000 per bungalow, the redwood men are not going to see the redwood forests pass away. For this reason, they sent forestry experts out into the redwood groves in 1922, began planting in 1923, and this year of 1925, are completing the setting out of four million young redwoods on 3,000 acres of land.

The first step, after the rate of growth, cost of planting, returns on the investment and general probabilities of success had been learned was the gathering of the seed. This done, two nurseries were established, which, in 1923, produced 750,000 seedlings large enough for transplanting,

that is to say, twelve to fourteen months old. These were set out on 750 acres of cut-over land, a rough average of 1,000 trees to the acre. The 4,000,000 young redwoods produced in 1924 were planted on 3,000 acres of land, the planting being a trifle closer together than previously. A schedule has been worked out so that in five years, possibly less, the regular yearly planting will be 10,000 acres.

All the cut-over land is first cleared of underbrush to reduce the fire hazard. Then the surveyors mark the planting place for each tree. The little saplings are about a foot in height, and have been once pruned in the nursery, so as to give them greater root growth and stronger stocks. The planter carries a bag of these seedlings and a mattock. He digs a hole at the point indicated by the surveyors, plants the seedling a trifle deeper than it was in the nursery, tamps the earth back into the hole, and goes on to the next planting.

MOTOR TURNS BARBECUE MEAT AT PROPER SPEED

Weighing only seventy-five pounds, a portable electric-motor unit for turning meat at barbecues can be adjusted for various speeds according to the heat of the fire and the kind and size of roast. The spits are made of cold-rolled steel and can be used separately or in series. Easily stored away or carried about, the outfit is adapted to all sorts of outdoor functions.

Meat on Spits That Are Revolved by Electric Motor at Proper Speed for Roasting

GAUGE TELLS WHAT TO EAT TO KEEP TRIM FIGURE

One of the aids to health and physical development at Columbia university is an instrument that gives students a scientific guide as to how much they should eat. By means of a respiration gauge slipped over the subject's nose and mouth, it measures the amount of oxygen consumed in a given period. On this basis, it is possible to estimate the quantities and kinds of food that should be eaten to preserve health and maintain proper weight.

Measuring Oxygen Used by Subject in Breathing, as Basis for Estimating Correct Diet

MOUNTAIN OF SALT MILE WIDE EIGHT HUNDRED FEET HIGH

Long regarded by superstitious natives as the haunt of evil spirits, a mountain of salt, in Algeria, a mile across at the top and 800 feet high, is to be mined for commercial purposes. In spite of the soluble character of the material, the hill stands in high relief from the surrounding country and is almost smooth except for a number of sinkholes which the heavy seasonal rains fill, the water bubbling out below as briny springs. It is proposed to run this water into pans and evaporate it to reclaim the salt, while most of the material will be dug out with picks and shovels. A railroad is to be built to the mountain.

¶ Ditches of water instead of fences keep Holland cows in their pastures.

TENNIS AND GOLF BALLS TESTED ON MOTOR-DRIVEN BOUNCER

Golf and tennis balls are tested for proper bounce and balance with a motor-driven apparatus consisting of an endless-chain elevator, a chute, a marble slab and a caddy bag with a hole in the bottom. The operation is continuous and once started, requires no attention from the attendant except to watch for defective balls. The spheres are carried to the top of the elevator, roll down the chute, bounce from the platform into the bag, pass down an inclined runway, and are carried up the elevator for another test. This is the procedure if the balls are not defective, for the bag is set at the correct distance, and its mouth, six inches in diameter, is considered wide enough to catch all the good balls. Those that fall short or go to one side are imperfect. When tennis balls are tested, an ordinary racket is used in place of the marble slab.

Testing a Golf Ball on Bouncer; Dotted Line Indicates Its Course from Platform to Slab and Then into Bag

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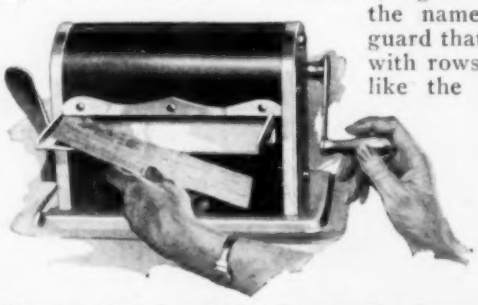
¶ Filling stations in England are being equipped with luncheon, tea and rest rooms so that while their car is being replenished with gasoline, the motorists may enjoy refreshment.

CARGO OF RARE SNAKES TAXES ZOO KEEPERS' SKILL

Transferring a shipment of seventy-eight snakes from a steamer to the Bronx zoo, proved an exacting task for Curator Raymond L. Ditmars and his staff. The boxes containing the reptiles were placed in a large army truck. A guard was stationed at the back end with a heavy club with instructions to "strike first" if he saw one of the serpents' heads. Arrived at the zoo, the operation of getting the snakes into their cages called for special care. Wire loops were slipped over the heads of the larger specimens and the keepers handled the mambas, whiplike reptiles that can strike with great rapidity, with extra precaution. These snakes are green in color, and in their native haunts, hang down from the trees like vines and strike their victims in the face or neck. Others in the lot included the rhinoceros viper, a large-headed reptile with two horns; three gaboon snakes, colored like butterflies, with bodies three inches in diameter and heads as large as a man's hand; four boomslangs, ropelike serpents with lumpy heads, and four giant black cobras of a variety that can project venom several feet.

CHECK GUARD PERFORATES FACE LEAVING BACK SMOOTH

Checks are protected against alterations in amount, signature, number, date and the name of the payee, in a guard that stamps the front side with rows of little raised lumps like the dots of a code and leaves the other side smooth for endorsements. It uses no ink and requires no adjusting. The check is inserted under a roller, a handle turned, and the protecting marks are made instantly. It occupies but small desk space, weighs only three pounds and has no parts likely to get out of order.



Removing Check from Inkless Protector That Stamps Lumps on Face but Does Not Mutilate Back

Hunting Birds' Nests for Soup

Borneo Birds'-Nest Hunters with Their Implements, and Glimpse of Climber on Vine

Sighting a Bird, Huntsman Pauses in His Search; the Nests Are Made of Sticks and Fastened Together with Secretion from the Birds' Beaks; It Hardens and Resists Rain

Native with Package of Nests Bound for Shipment

Native Crew Setting Off in Their Boat for the Jungle Where They Will Hunt for Nests; Many Make Their Living in This Manner

Courtesy Ewing Galloway

SHIELD OF BULLET-PROOF GLASS SAVES PILOT'S LIFE

Although bullets fired from coast-guard officers' guns pierced the steel superstructure of a swift rum-running boat, captured after a twelve-mile chase, they failed to penetrate one of the windows of special glass that surrounded the wheel house. The transparent shield was only dented. Its strength probably saved the pilot's life. The boat was found to be well equipped in other respects for its purpose. It was sixty-five feet long, had a 1,350-horsepower engine and carried several thousand gallons of gasoline.

Pointing to Window on Rum-Runner's Pilot House That Cracked but Did Not Break When Bullet Struck It

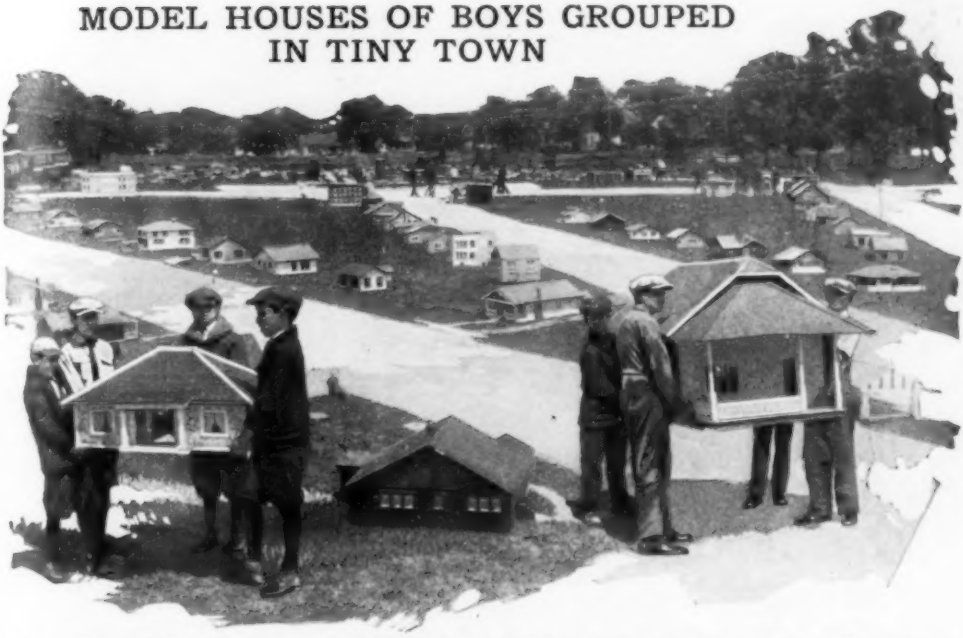
SNAKE BITES RESULT IN DEATH OF FOUR HUNDRED PERSONS

More than 400 persons have died from the effect of snake bites in the United States during the last three years, according to statistics. The greatest number of fatalities has been in the southern states. An increase in the number of such accidents has been predicted as a result of the growing number of persons engaged in hiking, camping and long-distance touring. While snake-bite serum is the best remedy, tourists are urged as a protection to wear stout shoes reaching well above the ankles, or heavy leggings, and also not to pitch camp near a ledge or swampy ground. Before going into a snake-infested area, a camper should provide himself with a rubber ligature, sharp scalpels or a razor, antiseptic gauze, permanganate of potassium crystals for the preparation of antiseptic solution and a tube of antitoxin, if available. In the treatment of snake bite everything depends on promptness. The ligature must be applied above the bite and the punctures enlarged by cutting into them. Two cuts should be made over each puncture, crossing each other. It is not dangerous to suck the blood away provided there are no cuts or fresh abrasions in the mouth or on the lips. The wound must be kept open and draining, well saturated with the permanganate solution. Most important of all, if no serum can be had where the accident occurs, the victim should get in touch as quickly as possible with the nearest point where it may be found.

SPRING CAP ON GASOLINE TANK SAVES TIME AND LOSS

Opened by a touch on a spring, a tightly fitting, patented gasoline-tank cap that saves time, cannot get lost and thus tends to prevent leaking and evaporation, has been put on the market. After it is once screwed on, it need not be removed to fill the tank, as the hinged lid falls far back leaving a wide inlet. The attachment is nickelplated.

MODEL HOUSES OF BOYS GROUPED IN TINY TOWN

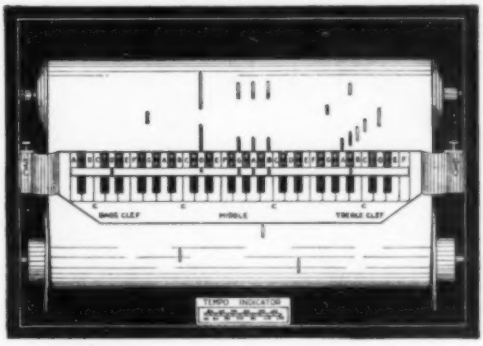


Seeing City of Model Homes from a Stepladder, Gives the Effect of an Airplane View of Real Town; Boys Bringing in More Houses for the Display

Schoolboy carpenters in a Missouri city arranged scores of model homes they had constructed into a miniature city to display their handiwork more effectively. Streets and 1,200 tiny lots were laid out systematically and the houses were carefully placed in positions best adapted to their form and size. Business buildings formed a realistic "downtown" section, while filling stations, garages and a power house added to the modern appearance of the village. Many of the houses were decorated and completely furnished inside. During the erection, a girl mayor and a staff of assistants jointly supervised the operations.

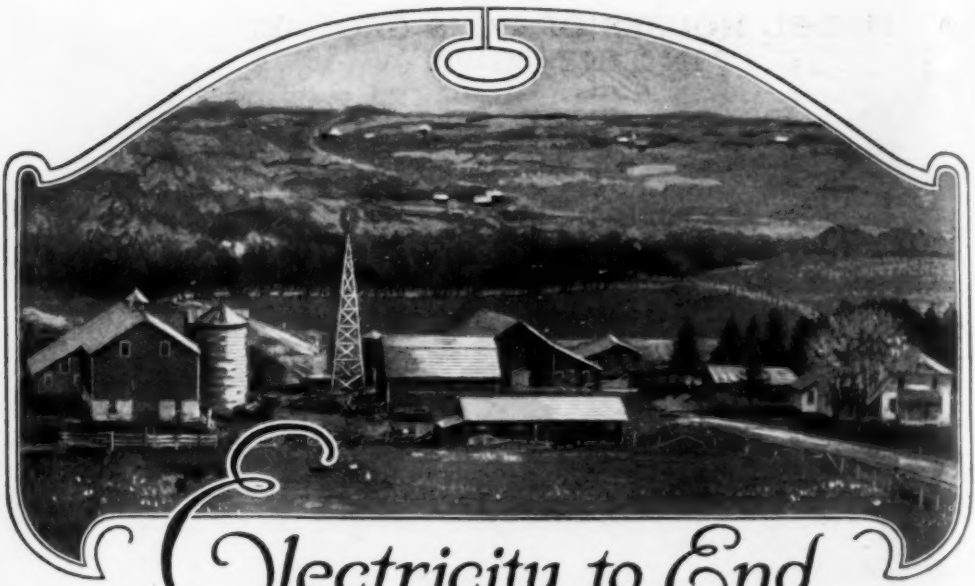
MUSIC TAUGHT BY PIANO ROLL AND LETTERED KEYBOARD

Instruction in vocal or instrumental music is afforded in a paper roll and lettered-keyboard arrangement that fits either player or ordinary pianos. In the mechanical instrument, it fits over the tracker bar; on others, it occupies the usual space for the sheet music and is turned by knobs at the sides. As the perforations on the roll pass through, they slip under corresponding spaces on the keyboard diagram which is marked for the bass, middle and treble clefs. The method is to strike the key with the finger as the perforation slides by to aid in memorizing the note. Melody parts for the voice or for an instrument can be picked out of the record and followed through in this way, slowly at first and then more rapidly. In learning to play the piano, one hand is to be mastered first, then the other, and finally the two together. A special instructor roll and a set of six containing sixty lessons are provided.



Music-Instructor Roll with Its Lettered Keyboard, Which Identifies the Notes as They Are Played

¶Names and addresses of manufacturers of articles described in this magazine will be furnished free by our Bureau of Information.



Electricity to End Farm Drudgery

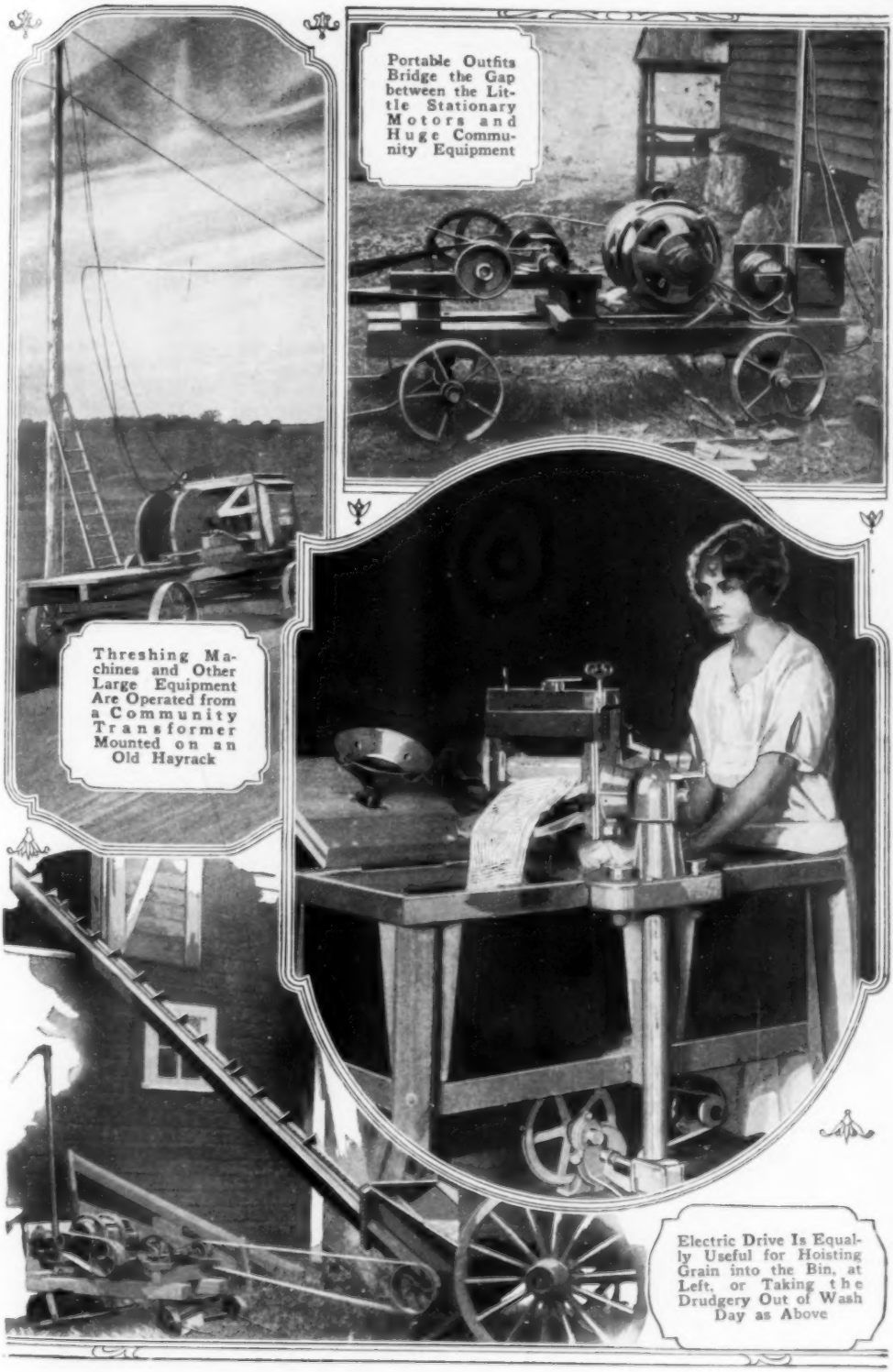
RUNNING farms by electricity is being tried out in eight states, with at least four more preparing to fall in line. The electrified farm, however, is merely an experimental laboratory in which experts are working out the mechanical problems of applying electrical energy to the business of raising grain, vegetables, cattle and other live stock. The results achieved will determine whether the power companies of the various states will serve rural customers. There are 6,500,000 farms in the United States and it is estimated it would cost $6,500,000,000 to equip all of them for electricity.

Farm electric lines have been tried out many times, and invariably fell short of success. The first cost of installing the poles and wires was so great that the power companies, as a rule, declined to do the work, and, even after the farmers financed the installation and deeded them free of charge to the company, the lines almost without exception proved money losers, since the farmers did not use enough current to pay the cost of upkeep, bookkeeping, meter reading and other expenses. Practically all of the 170,000 farms now using electricity confine it to lighting only.

Starting at Red Wing, Minn., in the winter of 1923, the first experimental farm line was built, backed by the power company, farm bureau federation officials, leading farmers, the state university department of agriculture and manufacturers of electrical equipment and farm machinery. The idea back of it was to find out where the farmer could profitably use current, how much he could use, what equipment he would need, and what change in design of farm machinery would be necessary to permit electric operation.

The line, a little over six miles in length, passes nineteen possible customers, of whom eleven have electrified their farms. The electrical-equipment manufacturers agreed to loan the necessary machinery for a period of three years, after which time it could be returned without expense to the farmer. The entire experiment is under the control of the agricultural department of the state university, and, on the basis of the manufacturers' terms, the farms have been equipped with labor-saving devices from house to barn and on into the fields.

"You can let your imagination run riot on what real electrification on the farm will mean to the farmer and his family," one of the power-company officials connected with the experiment says. "Attractive, efficient illumination in itself would bring material cheer and comfort



Portable Outfits Bridge the Gap between the Little Stationary Motors and Huge Community Equipment

Threshing Machines and Other Large Equipment Are Operated from a Community Transformer Mounted on an Old Hayrack

Electric Drive Is Equally Useful for Hoisting Grain into the Bin, at Left, or Taking the Drudgery Out of Wash Day as Above

to rural life, but go beyond that. Think what the motor on the well may accomplish! It means a dependable water supply, and that means a kitchen sink with running water, a regular city bathtub with hot and cold water, showers when returning from the fields and the installation of modern plumbing. It means added revenue by having drinking basins in the barns, for it is well known that dairy cattle with adequate water facilities will give more milk than animals that are led to the trough on a cold winter's morning, when the farmer has to break the ice so that they can get water which is entirely too cold for their taste. Electricity on the farm means the lifting of the burden of drudgery from the farmer's wife. You probably have seen the farm woman on a hot summer's afternoon standing over a wood fire range with a half dozen old-style sadirons heating and the temperature well over a hundred degrees. Electricity on the farm means the electric iron, the electric washing machine and the electric mangle. It suggests the possibility of electric refrigeration at the point of production which means a premium for sweet cream and certified milk.

Heat and Fire Danger Are Absent from the Electric Threshing Machine, at Top; Center, Pumping Water, and an Electric-Farm Milk Refrigerator

"Electricity on the farm means the elimination of fire hazards, caused by the horse or cow kicking over the barn lantern, and in the farm residence, perhaps, a fall with the kerosene lamp on a dark stairway. It opens up the possibility of cooking with an electric range, which may in the long run prove cheaper than the cost to the farmer of cutting timber in his own woodlot. It means the death knell not only of doing the family washing over an old-fashioned scrub board, but likewise of carrying countless pails of water every wash day.

"It may mean the elimination of hired farm hands. One of the farmers on our Red Wing line says he is never going to hire another hand now that electricity has started to do the farm work for him. Two families on the Red Wing line had intended to give up their farms and move to the cities until electricity came to them. They say they now have all the advantages of country life, with the added attractive features of city life.

"Running water has put a bathroom in every home on the Red Wing line, and shower baths in some. The farmers tell me they never knew what a real bath was until electricity made bathtubs and showers possible.

"When the electric mangles and irons were installed the farm women ironed everything they could get their hands on and I found one young woman

Crisp Biscuits Are Baked in Electric Ranges, with the Terrific Heat of the Old Wood Burner Absent from the Kitchen

All Dressed Up, the Farmer Runs the Milk through the Electric Separator

Fodder Fed into the Electric-Driven Ensilage Cutter and Blower Is Chopped into Bits and Blown up the Stack to the Top of the Silo; Note the Conveyor Belt Which Abolishes the Back-Breaking Task of Forking Heavy Green Cornstalks into the Ravenous Maw of the Machine; Even the Truck Which Hauls the Milk to Market Has Electric Refrigeration to Insure the Quality of the Product

running her father's overalls through the mangle to put a crease in them. Previous to this she had ironed everything else around the place.

"The big problem in farm electric lines has been the investment in wires and poles. An average of three customers to the mile is about the maximum possible in the country, as compared to from fifty to 200 in a city, so all the overhead must be borne by the three.

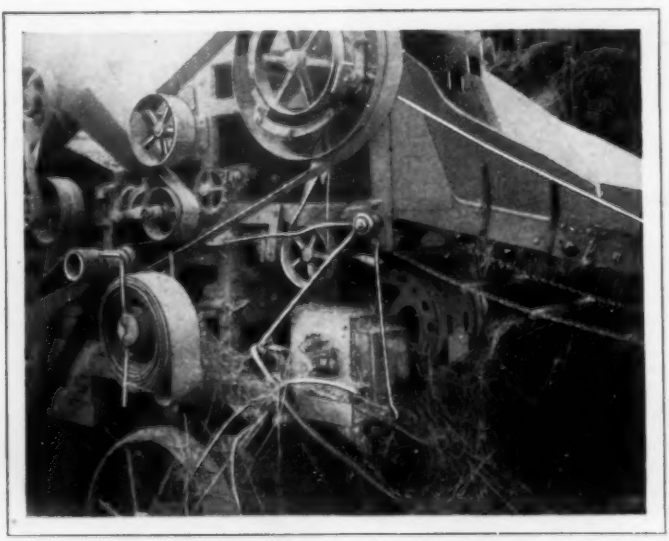
"It is impossible to transmit or distribute power, however cheap, any great distance and have it remain cheap. Every mile of line costs money to build and the interest and depreciation charges must be paid out of the revenue received from the power transmitted over it. The farther from the source of production the more expensive power becomes. Even if all water-power resources now going to waste were developed, water only produces power—it does not deliver it to the farm where it is to be used. Water-power projects are expensive to build but if they cost nothing and the power cost nothing at the power house, the farmer would still have to pay. An average ten-mile line, serving thirty farms, if used for power, would cost at least $1,500 per mile or $15,000 for ten miles. Allowing for return on investment, depreciation, taxes, insurance and maintenance, etc., means that the line will cost those thirty farmers $2,700 per year or $90 each, whether any current flows through it or not. Each farmer must pay $7.50 per month, even though the power is furnished free."

The Minnesota power company which erected the experimental project, figured out that the service charge to cover interest, depreciation, maintenance, taxes, insurance, bookkeeping, meter reading and energy losses would amount to $6.90 per month, on the basis of three customers to the mile. The charge therefore was fixed at $6.90 for service, plus five cents per kilowatt-hour for the first thirty kilowatt-hours, and three cents for each kilowatt-hour thereafter.

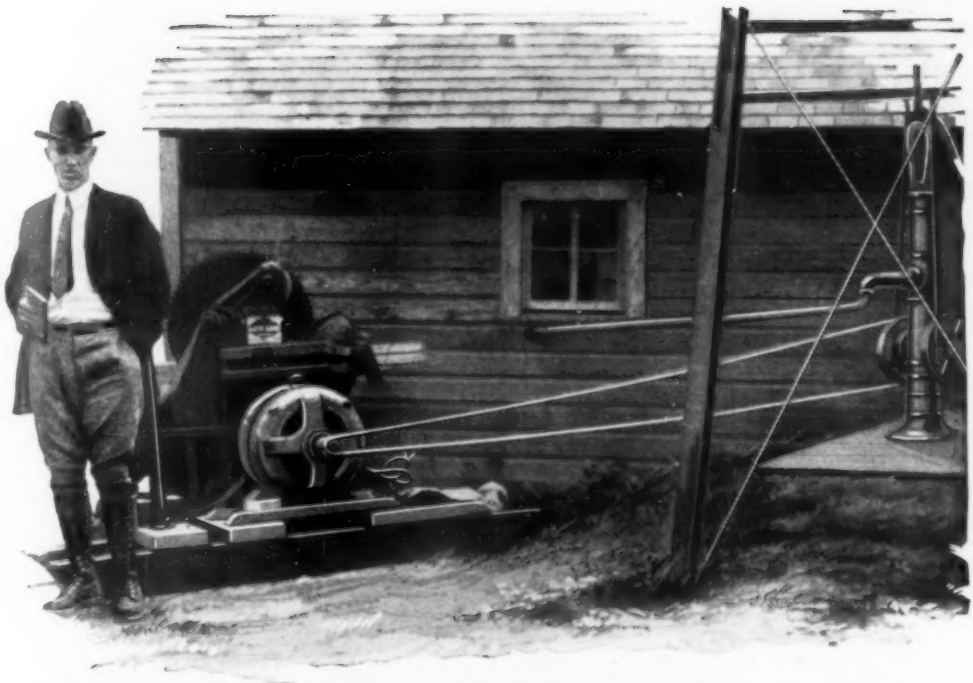
The next problem was to find enough labor-saving uses for current so that the farmer could afford to use enough to bring the average cost down to a reasonable figure. The customer who used but twenty kilowatt-hours would have a $7.90 bill, or thirty-nine and a half cents per kilowatt, but the man who used 100 kilowatts would have a bill of $10.50, or ten and one-half cents per kilowatt-hour, while a 300 kilowatt-hour consumption per month would bring the average down to five and one-half cents.

The committee in charge of the project divided farm uses for electricity into three classes: convenience, such as light in the house, barns and yard; labor-saving devices, both in the house and on the farm, and electrically driven apparatus which may actually produce additional revenue.

They found one farm which had been grinding four tons of feed a week to feed beef cattle, using three men, a twenty-horsepower gasoline engine, a team of horses and a wagon, besides handling the feed five times during the process, could perform practically all of the labor automatically by using electricity, and release two of the three farm hands for other work. The labor-saving devices in the farm yard also include grain conveyors, ensilage cutters, grindstones, pumps, fanning mills, saws to cut up fuel and bigger motors to run corn huskers and threshing machines. In the house, labor-saving has been applied to washing, ironing, churning, pumping water and running the cream separator. The applications of current which actually produce additional revenue range from lighting the hen house in winter to encourage the chick-



An Experimental Motor and Rheostat Installation on a Threshing Machine, Abolishing the Old-Fashioned Steam or Gasoline Tractor



The Windmill Rod Is Disconnected and Electricity Pumps the Water, While the Same Motor Drives the Saw Which Quickly Reduces Firewood to the Proper Size

ens to produce more eggs, when prices are high, to getting more milk by having running water in the barns for the cattle to drink, getting more cream out of the milk with an electric separator and running an electric refrigeration plant to keep the milk in good condition.

The experiment, in the first year of operation, disclosed that special provision was needed to convert farm machinery into efficient electrically driven apparatus. Cream-separator makers had already provided for the change by making motor units which could be attached to any hand-operated separator in a few moments.

Most of the experimental farms have been equipped with small fixed motors, ranging up to one-half horsepower, for all machines which are in frequent use; one or more larger portable units which can be moved from one task to another when the tasks are only performed weekly or biweekly, as in grinding feed, and, in addition, the committee has furnished a big community transformer, mounted on a wagon, and a portable community motor of large size for threshing machines and other heavy-duty operations.

Trouble has been encountered with the varying motor speeds required, some machinery on the farm operating at slow speed, some at high, and others with a variable speed which changes quickly under various load conditions.

The experimental committee has tried line shafts in some farm buildings to get different speeds; countershafts mounted on the same frame with the portable motor; speed jacks on the motor frame; back-geared motors, and, in one case, has even equipped a motor with an automobile transmission. Out of all the experiments they expect to produce general rules of practice to govern future manufacture of electric farm equipment.

Their investigations disclosed that an average farm would use twenty-five kilowatt-hours a month for lighting the house, barn and yard; five or six to run the cream separator; 100 to operate a kitchen range; five to run the washing machine; twenty-five to pump water to house and barn; sixteen to do the family ironing; while sixty kilowatt-hours would run a three-horsepower feed grinder an hour a day; or a total of approximately 200 kilowatt-hours for the entire farm each month. In an average summer month one farmer on the experimental line used forty-six kilowatt-hours, costing him $8.88, and another 450, costing $21.00. Thus the charge per kilowatt-hour ranged from 19.3 down to 4.7 cents.

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Steel Workers' Climbing Shoes as Worn on Flat and Perpendicular Girders, and Top Side Showing Toe Strap and Projection

SHOES TO FIT STEEL GIRDERS AID TO IRON WORKERS

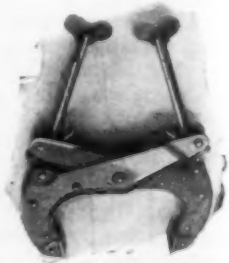
Special climbing shoes have been patented by a steel erector to aid in scaling perpendicular girders and in walking across high beams. They are flat-bottomed and narrow to fit in angular-shaped pieces, and have projections on the front to grasp the flanges while mounting vertical members or to be inserted in rivet holes if the climber desires to rest during the ascent. A strap across the toe holds them to the foot.

SCIENTISTS READ AGE OF EARTH BY "EXPLODING" ATOMS

Geologists are seeking clues to the age of the earth by measuring the time it takes for changes to occur in certain kinds of radioactive rocks. For instance, the constantly "exploding" atoms in uranium —an ally of radium—eventually decompose into lead. By chemical analysis of earth samples taken from a district in Canada, Dr. H. V. Ellsworth, of the national research council committee on estimation of geological age, has calculated that the relative amount of radioactive elements and lead-decomposition products found indicate that the minerals in the region examined date back at least one and a quarter billion years. This vast stretch of time does not extend to the period when the earth was molten. There is some dispute among scientists that such a condition existed, but if it did, one authority has figured that the earth must have been in a molten state at least a quarter of a billion years before the formation of the ancient granites. Lead derived from radium is like the ordinary metal except that it is a trifle lighter. Lead from thorium, another radioactive substance, is slightly heavier. The general uniformity in the mineral's weight is believed to be due to mixing that occurred when the earth was in a molten condition.

SLIDING SCREWS ADJUST CLAMP QUICKLY

Rapid adjustment, strength and adaptability to irregular as well as flat surfaces, are claimed for a patented steel clamp shaped like a pair of tongs and closed and opened by two long thumbscrews. These slide quickly through the bronze nuts which engage the threads until the clamp is attached to the work, saving time in operation. Pressure is applied from the back, is evenly distributed, and since the jaws are self-adjusting there is little likelihood of the work turning or creeping and a tight grip is obtained on tapering and uneven surfaces. The screws push in a straight line, and as the centers change when the jaws move, there is slight danger of bending. Steel sides fit the clamp for rough use.



"FIRING" ON TOY BATTLEFIELD CURES "BUCK FEVER"

Artillery Students Watching Theoretical Gunfire on Miniature Landscape; "Hits" Are Indicated by Puffs of Smoke and Electric-Light Flashes; Left, Operators Stationed behind Practice Board Work Mechanism Tracing the Course Shells Would Take and Regulating Smoke Puffs

For teaching artillery students at Yale, a miniature landscape has been laid out on a board that gives all the conditions of service firing except the noise. Targets are placed on the model landscape and puffs of smoke regulated from the back of the board follow all the commands. The student supposed to be in charge of the battery gives his orders as though he were actually laying the guns, and two operators behind the board trace the course a shell would take by means of jointed levers moving under the wire netting that serves as the base of the model. Puffs of smoke, made by heating a wire in an oil flame, then imitate the bursting of shells. For a direct hit, a small electric bulb flashes with each smoke puff. This practice in firing eliminates many mistakes and the usual "buck fever" of the beginner's first efforts on an outdoor range.

CONCRETE POOR INSULATOR

That concrete has little insulating value is indicated by the condition of wooden piling discovered beneath boiler ash pits at a western power company. Although there was a six-foot layer of earth and concrete between the piles and the pits, workmen who were underpinning the building, found that heat had penetrated down to the wood, charring it so completely that replacement was necessary.

NAIL SORTER WORN BY WORKER INCREASES EFFICIENCY

A nail stripper or sorter for shinglers, box makers, and others, is worn suspended

Picking Nails from Handy Sorter Worn by Neck Strap in Convenient Position

by a strap around the neck, and is claimed to greatly increase the efficiency of the worker. The patented receptacle is filled with nails which drop point first into slots when the holder is shaken. As they are needed, the workman can strip them from the ends of the grooves with the thumb and forefinger in any quantities desired. The device eliminates the habit of carrying nails in the mouth while working, a practice which often causes metallic poisoning. In tests, the use of the sorter is said to have increased production of the worker more than twenty-five per cent.

USE OF PINS INCREASES

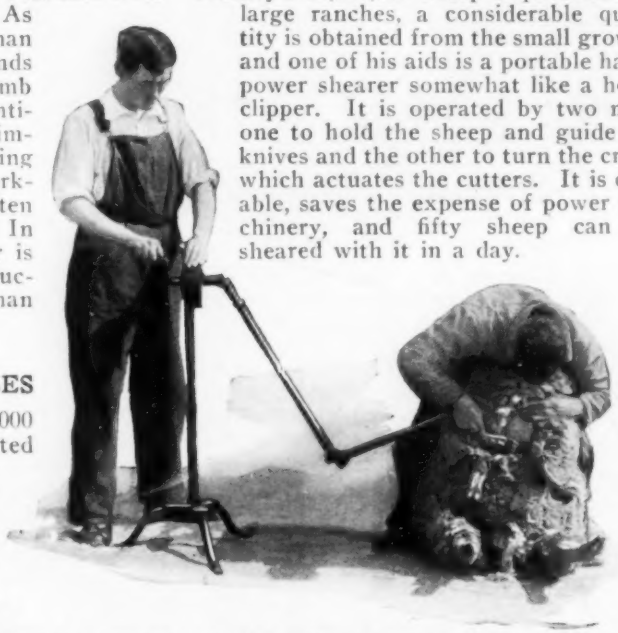
More than 20,000,000,000 pins are used in the United States annually, about 200 per capita, according to recent estimates, and the number is said to be increasing. This lowly article once was made only by hand and accordingly highly prized, but now they are applied lavishly to shirts both new and from the laundries, dressmakers and tailors use them in abundance and offices draw heavily on the supply. Ten large factories are engaged in their manufacture.

NEW TRANSMITTER FOR RADIO TO REDUCE SENDING COSTS

Reduction of transmitting costs and elimination of fading and the effects of atmospheric conditions, are results claimed for a radio-sending apparatus invented in England. It is described as a "compound focus" arrangement, and is said to afford absolute secrecy even when many sets are being operated at once. It uses but one-tenth of the power required for the ordinary broadcasting unit of the same capacity, according to reports; it is estimated that a complete transmitting plant of the highest efficiency would cost not more than $1,300, and that world-wide wireless messages could be sent at a cost of four to six cents a word. On experimental tests, continuous communication was maintained by a ship in the Atlantic with British and American stations.

HAND-POWER SHEEP CLIPPER AIDS SMALL GROWER

While most of the average annual clip of 300,000,000 pounds of wool from the country's 38,800,000 sheep is produced on large ranches, a considerable quantity is obtained from the small grower, and one of his aids is a portable hand-power shearer somewhat like a horse clipper. It is operated by two men, one to hold the sheep and guide the knives and the other to turn the crank which actuates the cutters. It is durable, saves the expense of power machinery, and fifty sheep can be sheared with it in a day.



Shearing Sheep with Hand-Crank Clipper; Elbow Arm of Shaft Permits Free Movements and Whole Outfit Is Easily Carried

Saving Dollars with Knots

BECAUSE people are careless or do not know how to wrap articles for the mails, thousands of dollars worth of property is lost every year, costly delays result and scores of post-office employes are forced to spend their time rewrapping the public's parcels.

Last year, the Chicago department alone put new paper and string on 471,350 parcels that had broken or become untied. But thousands of others were so badly wrecked that they could not be sent on their way. They were held a few weeks and then sold at public auctions. Sales of this kind throughout the country last year added about $120,000 to Uncle Sam's treasury.

Carrying out the educational policy of Postmaster-General Harry S. New and First Assistant John H. Bartlett, Postmaster Arthur C. Lueder of Chicago has entered into an arrangement with the superintendent of schools, to teach school children how to wrap parcels. The matter also has been taken up with the National Education association, composed of superintendents of school systems and teachers throughout the country, and groups are visiting their local post offices where they learn how the mails are being handled and see some of the hundreds of broken parcels received every day.

Here are a few of the pointers that Uncle Sam's experts have learned in handling packages: Use plenty of strong twine and do not rely on inferior qualities of paper tape, it tears and becomes unsealed; be sure that the contents of your parcel cannot shift, this often breaks the paper or punctures it so that articles fall out; use plenty of packing around loose objects, particularly those of metal that have sharp edges, as they are liable to cause damage, and put your name and address inside as well as on the wrapper.

In sending books, be sure to stack them so that they cannot buckle, causing the parcel to split open. Do not use too much moisture on the stamps. Big firms, post-office workers declare, often make

this mistake. Blame is believed to rest on the office boy who uses too wet a sponge to dampen the stickers. This wipes off the glue. Many of the 4,125,000 pieces of mail without postage received at the Chicago office one year had lost the stamps in transit. Do not trust an ordinary store wrapping to carry an article safely through the mails.

Postmasters say that many persons persist in sending cakes and other dainties with nothing but the baker's wrapper to shield them. If you have separate articles to ship in one parcel, cover each to shield the outer paper from sharp corners and to prevent shaking. Be sure that the parcel is addressed plainly and correctly. This is equally important for letters; more than 10,000,000 are returned annually to the senders from the Chicago office alone for failure in this particular.

Men who handle post-office "nixies," the misdirected let-

Typical Parcel Wrecks the Post Office Receives Daily; Careless Wrapping with Inferior Paper, Poor or Insufficient String Causes Delays and Thousands of Dollars' Loss

ters and broken parcels, are highly skilled and sometimes are required to assume the role of detectives to find the owners of stranded articles. Not long ago, a girl in New York sent a $20 bill in an unsigned letter to her friend "Mona" in Chicago. It was sent to the

Truck Sign Chicago Post-Office Department Used to Promote Better Wrapping; an Easter Bonnet That Did Not Arrive on Time and, Postmaster Lueder Showing School Children How to Wrap Books

dead-letter office but was finally delivered by careful study of the quality of paper and the character of the handwriting. Every day, the nixie clerks handle an amazing assortment of articles. A glance into their department reveals pitchforks, coconuts sent in

More Parcel Wrecks and Pupils Learning Correct Wrapping Methods in Schoolroom and at a Post-Office "Nixie" Department with Clerks as Teachers

the outer hull as souvenirs from Florida, shoes, radio sets, clothing and a wide variety of perishable goods. Clerks in one post office not long ago, while handling a cake addressed to China, discovered a revolver and some cartridges under the frosting.

It costs Uncle Sam $1,740,000 yearly just to look up the addresses on misdirected mail. A small portion of this is regained in the $92,000 spent annually for postage to get matter back from the dead-letter office. In spite of the careful efforts of the department, about 21,000,000 letters and 803,000 parcels every year cannot be delivered mainly because of errors on the part of the senders. Clerks find about $55,000 in cash in letters that reach the main nixie division and official figures show that $3,000,000 in checks, drafts and money orders sent through the mails, never reach the intended owners. Nearly 100,000 letters are mailed every year in blank envelopes. By educating the public to be more careful, the Chicago department reduced the number of pieces received unstamped from 4,125,000 to 3,000,000 in one year.

OMITTING MAIL BAG STRIPES SAVES U. S. THOUSANDS

Reduction of government expenses under the budget, from $5,115,927,689, in 1921, to slightly more than $3,500,000,000 for the fiscal year just ended, was accomplished largely, not by huge curtailments, but by hundreds of small savings such as a thrifty housewife or an economical business man might employ. For instance, simply leaving out the blue stripes in the mail sacks saves the government $49,000 yearly. It cost a cent a yard to put them in, they served no practical purpose and decreased the value of the canvas scrap. By taking stock of materials and turning them from departments where they were not needed to those that could use them, $2,763,000 was saved, while waste paper, metal scraps, old rubber, empty barrels and other odds and ends netted a profit of $287,966.30 in one year. In the government printing office alone, economy in the matter of twine has showed a saving of $1,000 yearly. At a chemistry station, paper drinking cups were abolished and individual glasses issued instead, with a $98 economy each year. Prompt payments on contracts have enabled the war department to take advantage of $1,344,688.55 in discounts.

GRADER WITH LEANING WHEELS CUTS ROAD-BUILDING COST

Graders with adjustable leaning wheels have been devised to prevent loss of power and to function more accurately on ditch and sloping road work. With the ordinary straight-axle implement, the side next to the bank gouges the earth, causing wear and waste in power, and resultant skidding reduces the capacity and interferes with correct digging. With the leaning-wheel arrangement the side pressure of the load against the blade is counterbalanced and prevents slipping. The grader can be adjusted to various operations with little difficulty.

Grading on Slope with Slanting-Wheel Scraper That Keeps Weight Away from Bank

MOTH PLANE, AUTO OF THE AIR, HAS FOLDING WINGS

Two-seater light planes "for everybody," with folding wings, are being made in England. They are known as "Moths" and are designed as a week-end substitute for an automobile. With wings folded back, the machine measures nine feet eight inches across and may be housed in the ordinary garage. An air-cooled engine gives a speed of eighty miles an hour.

Courtesy De Haviland

With Its Wings Folded at the Side, Tiny Two-Seater Airplane Is Easily Towed by Automobile

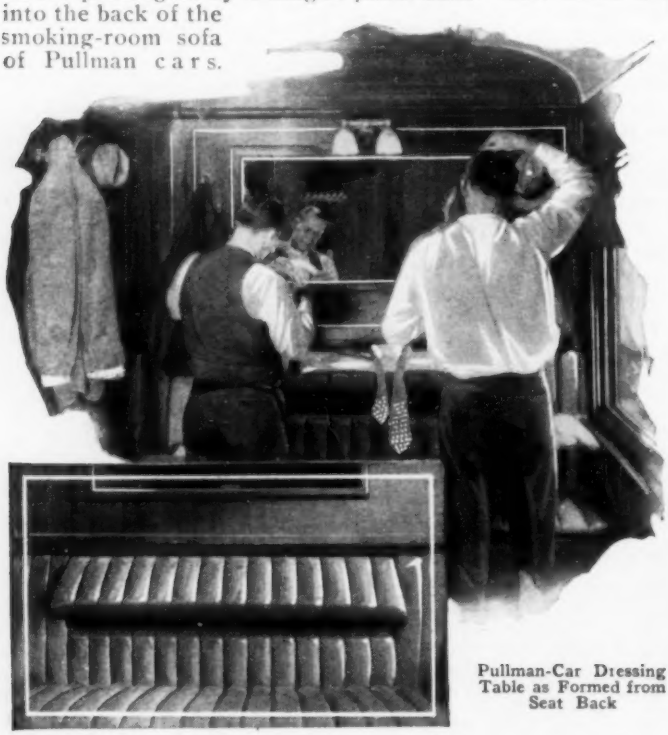
SUN REPLACED BY ELECTRICITY TO PRESERVE PAINTINGS

When it was discovered that sunlight, shining into the national gallery at London, Eng., had caused some of the fine old paintings to fade, the authorities decided to install electricity for illumination to prevent further disfigurement of the art works. Special glass to filter the electric light so that it becomes chemically harmless to the delicate pigments in the injured paintings will be used on the lamps illuminating them.

¶As an added convenience for the home, outlets for electric wiring to attach irons, percolators and other articles are being installed waist-high instead of in the baseboard as has been the custom.

SEAT AS DRESSING TABLE ADDS TO PULLMAN COMFORT

Additional space and comfort are provided for passengers by a hinged panel built into the back of the smoking-room sofa of Pullman cars.



Pullman-Car Dressing Table as Formed from Seat Back

When this panel is raised, it becomes a dressing table on which shaving kits and other toilet accessories may be placed. An additional advantage of the arrangement is that it prevents thoughtless passengers from occupying the seat during the rush hour of dressing. At other times the hinged panel folds down, in which position it is a part of the back cushion.

PICKING THE CITY DUMP HEAPS IS ORGANIZED BUSINESS

Every year, small fortunes are found in the ten-million-odd cubic yards of ashes and rubbish thrown upon the scrap heaps in New York City. The right to examine the piles is paid for by men known as "trimmers," many of whom have their names in the telephone directory and who do dump-picking on a wholesale scale. Once a year, word is issued from the department of street cleaning that the time has arrived for dealing out the dumps. Bids are made and the contracts go to those making the highest offers. Few of the professionals do the real work. They hire others or let subcontracts. When the wagons arrive at the dumping wharves, the drivers must see that rubbish, garbage and ashes are stacked separately. The most promising stuff, as a rule, is piled at one end. The pickers first examine this and then pass it on to the sorters. Then they closely look over the rest of the material, taking out bottles, discarded iron bedsteads, old springs, broken umbrellas, rags, magazines and like articles that may be sold to the junk dealers. Among the prize finds are cardboard packing boxes. These can be baled, tied and sold at large profit. Formerly wooden crates were valuable, but no longer, since the order was issued to crush them in the wagons to save space. Jewelry, coins and other valuables are found occasionally. These are usually pocketed by the pickers, and seldom get to the contractors' piles. The city nets about $900 a week for the picking privileges in Manhattan while over $800 weekly is received for the Bronx.

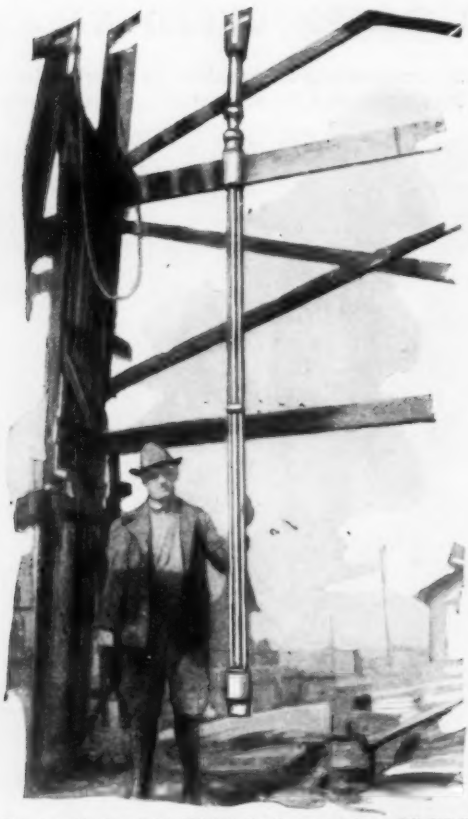
ELECTRIC-LIGHTED BALLOONS PROVIDE NOVEL DISPLAY

Attractive effects for night decorative or advertising displays are obtained by using illuminated toy balloons that contain a tiny bulb supplied with current from a small stationary battery. The light is inclosed in a tubular holder occupying the neck of the balloon. The cord is connected with a screw plug that makes an air or gas-tight joint with a rubber washer when it is in place at the other end of the cylindrical holder. A sphere sixty inches in circumference filled with hydrogen will easily lift the lamp and cord.

UNDERGROUND CATHEDRAL IS REPRODUCED IN WAX

Wonders of the so-called Endless caverns of Virginia have been reproduced in small wax models by members of the staff of the Milwaukee Public museum who journeyed to the caves and took their impressions directly from nature. From one of the rooms, a portion known as St. John's cathedral is to be rebuilt in actual size and will be placed alongside the museum's other large geological exhibits which already include realistic reproductions of the Grand Canyon and Mt. Rainier. Hundreds of feet below the surface and far from the entrance to the caves, the modelers set up their easels and sketched the intricate spires and icicles of stone, the stalactites and stalagmites that decorate this subterranean wonderland. Careful measurements were taken to assure absolute accuracy in reproducing the formations to the proper scale and color values were studied and noted for the guidance of the artists. The texture of the rock was closely examined so that it could be copied exactly in wax. The workers used electric lights supplied by storage batteries.

Copying Caves in Wax Directly from Nature; Milwaukee Museum Artists at Work



Electric-Heater Rod Which Is Lowered into Oil Well to Melt Accumulated Wax

CLOGGED OIL WELLS REOPENED WITH ELECTRIC HEATER

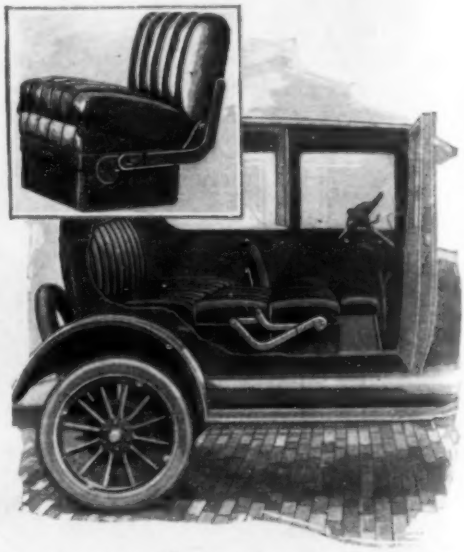
Increases in oil production are expected to result from the invention of an electric heater to melt the paraffin that accumulates in many wells, stopping the flow. It is estimated that less than fifty per cent of the oil in developed fields is obtained because of this wax. The heating apparatus is made in various lengths and is lowered by means of cables. When it is in the proper place, the electric current is turned on and a temperature sufficiently high to melt the paraffin is developed. The operation is continued for about forty hours, depending upon the size and condition of the well. The possibilities of the heater are indicated by estimates of experts, who say that, in the middle west alone, there are more than 100,000 wells with an average production of only half a barrel a day. The supply, they believe, is not exhausted but merely retarded because of clogging. Removal of this difficulty has been sought also by injecting steam, chemicals and firing off explosives.

FISH EGGS PLACED IN SHELLS ARE HATCHED BY HENS

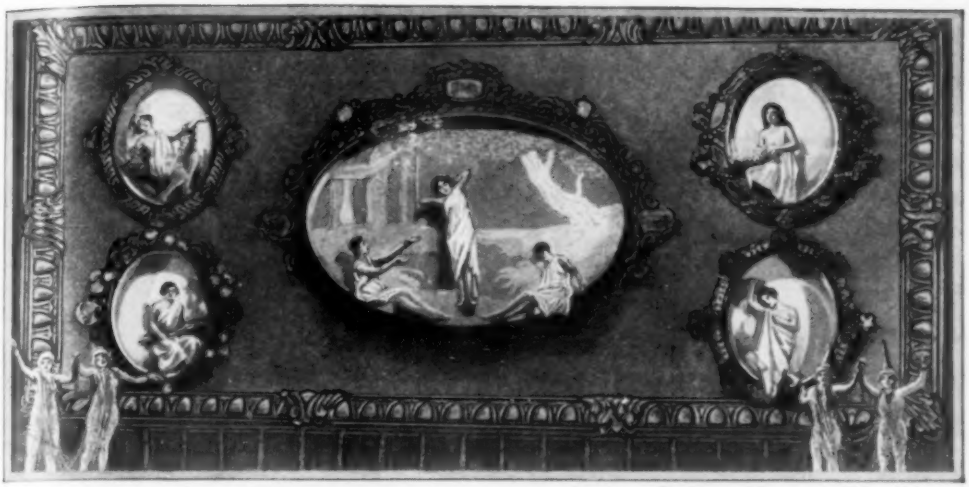
Fish farming with the aid of poultry is becoming increasingly popular in China. In some parts, it is said to pay better than hatching chicks, owing to the demand for fish with which to stock lakes and small streams. As the spawn is gathered, it is placed in eggshells, the ends are sealed with a special wax and the eggs placed under sitting hens. After some days, the shells are broken carefully and the spawn emptied into artificially heated water. Here, the little fish are nursed until they become strong enough to be moved to water a few degrees colder. This lowering of temperature is continued until the fish are able to withstand the water of the average lake or stream.

AUTO SEAT WITH FOLDING BACK CONVERTS CAR INTO BED

Front seats for automobiles are being made with folding backs and an extension underpart, so that the interior may be converted into a bed or used as an ambulance. The back, when down, fits flush with the rear seats and the end, placed under the cushion when not in use, has a drop bar to hold it in place at the level of the other sections. Collapsing the right front seat in this way, affords a handy and comfortable one-passenger ambulance without disturbing the driver's position.



Side View and Folding Seat Extended in Car to Form a Single Bed



Courtesy The Sphere

Stage Curtain Fashioned as Frame and Inclosing Five Separate Panels in Which Living Models Pose as Portraits in Lighted Booths with Colorful Backgrounds of Varied Hues

STAGE DROP AS PICTURE FRAME DISPLAYS LIVING MODELS

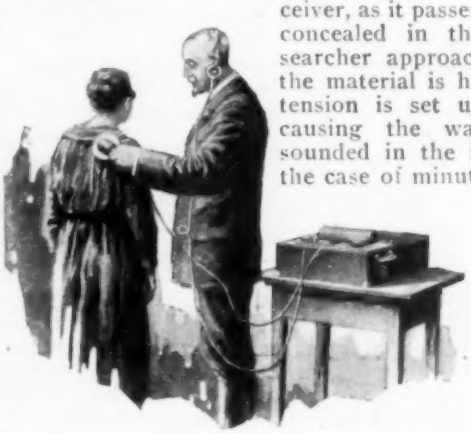
Patrons of a London theater were treated to a novelty in a huge curtain that represented a large picture frame and showed, within five inner panels, living models in various poses. Lighting was arranged to further carry out the illusion, and the effect was made more realistic by the border of the curtain, which closely resembled that of an ordinary gilt frame.

GLASS USED IN WALL MIRRORS TAKES TWO YEARS TO MAKE

Few persons stop to realize when they purchase a mirror for the wall that it took almost two years to make the glass and that many intricate and elaborate processes were required to give the reflecting surface its clarity. The first step is to make the pot for melting the glass. For this a composition of several high-grade clays is used. The mixture is exposed to the weather for a long period to season it, mixed with burned clay and water, kneaded in a mill and then stored about a year to ripen. Next follows a final treading process which renders the mass plastic and air-tight. The pots are then fashioned by hand, a process that calls for great skill to prevent airholes or any tendency to crack under intense heat. After the pot has been shaped, it is dried from two to four months.

MAGNETIC DISK HUNTS METAL HID IN WORKER'S CLOTHES

The usual method of searching persons for hidden objects of metal as a means of preventing thefts has been replaced by a simple, rapid and accurate electromagnetic process in a German electrical factory. A special testing disk moved over the outside of the subject's clothing causes a distinct sound in a telephone receiver, as it passes over a piece of metal concealed in the garment. As the searcher approaches the point where the material is hidden, a difference of tension is set up between two coils causing the warning signal to be sounded in the instrument. Even in the case of minute fragments of metal, the finder does not fail to reveal the presence of the object. The apparatus is said to be valuable for searching the employes of metal-working establishments, when they are leaving the premises, or persons suspected of theft.



Searching for Concealed Metal Objects in Subject's Clothing with a Magnetic Finder

THE biggest print shop in the world distributed 56,000,000 books and papers, pamphlets, and bulletins last year, placing them in the hands of millions of people to help them along in their life's work. The millions of publications covered every subject from how to raise chickens or plant a garden to the latest scientific developments in precision measuring tools and radio instruments.

All are the output of the government printing office at Washington, which publishes the discoveries of Uncle Sam's scientists and experts, as well as the speeches and work of public officials. To anyone, anywhere in the world, the scores of thousands of different publications are available at the mere cost of paper and printing, with no charge for the brains and scientific service that went into the discoveries reported. And for residents of continental United States, Alaska or any of the island possessions there is not even a charge for postage, since government documents have free transportation through the mails.

It takes seventy-two catalogs, some containing as many as sixty pages, to list the titles of all the government books and bulletins available to the public. The catalogs list the titles, the serial number to be used in ordering and the price of each publication. One catalog is devoted to information of interest to "Suburbanites and Home Builders." Another covers farm management, a third is devoted to bulletins and books on foods and cooking, and so on through almost every subject imaginable. To prepare all these booklets for distribution requires a vast printing plant with nearly 4,000 employes, 1,000 carloads of paper a year, and great quantities of ink, which is made in a factory right in the printing-office building. With 100,000,000 copies of various publications printed last year, the plant required an appropriation of $10,000,000, and had a payroll of almost $7,000,000.

Millions of people patronize this information factory every year, but there are probably millions more that do not know of its work, or how to use it. Suppose you want all the data government experts have collected on home building. A request for the catalog on "Suburbanites and Home Builders" will bring a booklet listing some 500 reports and pamphlets, covering every subject from the way chimneys should be built and fireplaces constructed to a study of roses and how to grow them.

For the farmer the catalog of farm-management publications covers studies on subjects ranging from accounting methods for country creameries to bulletins on how to choose a tractor. For mother there is a catalog covering booklets on canning, cold storage, home economics, recipes of every kind, helpful bulletins on food for young children, diet for invalids, meal planning from charts, and instructions on the making of such useful things as fireless cookers. The catalog likewise runs from selection and care of clothing all the way to floors and floor coverings. A radio catalog lists the government pamphlets on

Millions of Cards in an Immense Filing Cabinet Keep a Continually Posted Record of the Vast Stock of Government Publications on Hand, the Boys Withdrawing the Proper Card Each Time an Order Is Filled for One or More of the Pamph'ets

Washington's First Address to Congress

The Census of 1791, a Fifty-Two-Page Book, Compared to the Thirteen Volumes of the Census of 1920, Above; at Right, Only Printing Office in the World Which Has a Copperplate Facsimile Signature Cut Reading "Calvin Coolidge, President," Showing Printer Putting It in Form

construction and operation of all kinds of radio transmitters and receivers, as well as technical reports on the underlying principles of wireless communication. Like the others lists, these booklets may be had at prices ranging from five cents to a dollar, depending on how much paper and labor went into the work.

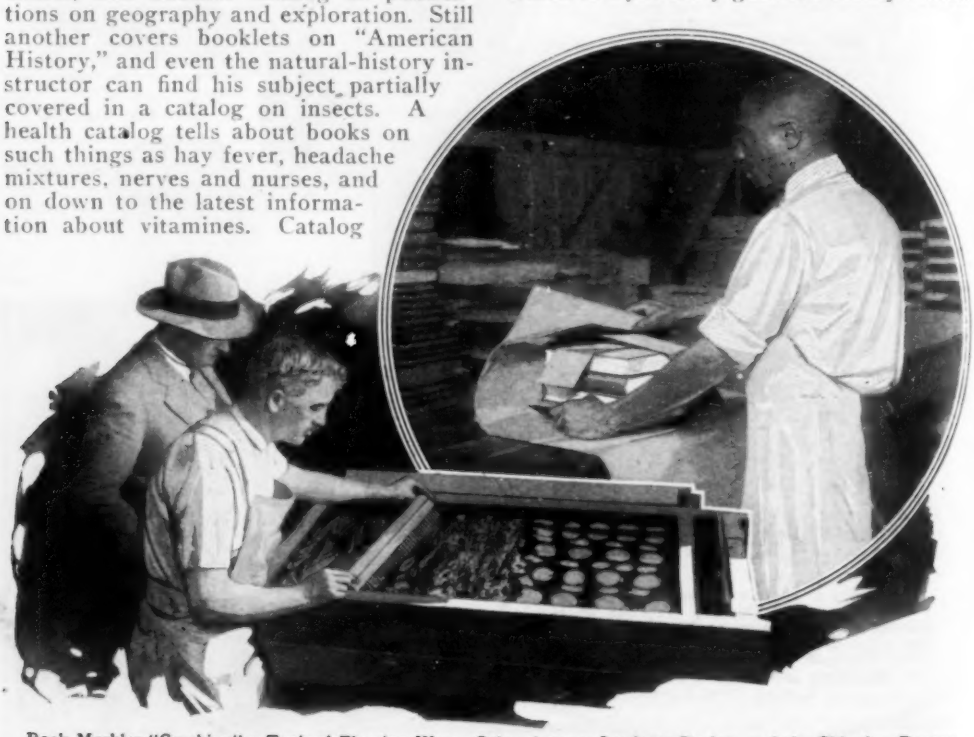
For five cents mother can get a pamphlet entitled "House Cleaning Made Easier" and study the scientific disposition of the semiannual home overhauling. The same price will bring her an interesting booklet on how to prepare attractive and appetizing lunches for the children to carry to school.

The home gardener can find a mine of information in the booklets prepared by the experts of the department of agriculture. Catalog No. 44 on the culture of fruit and vegetables lists hundreds of these pamphlets of interest to the city man with a back-yard garden, as well as the country gardener.

School-teachers can get a catalog entitled "Education" which lists several hundred booklets on subjects of interest to them. There is a separate catalog on maps, giving details and prices for the thousands of government maps and charts, and another catalog of publications on geography and exploration. Still another covers booklets on "American History," and even the natural-history instructor can find his subject partially covered in a catalog on insects. A health catalog tells about books on such things as hay fever, headache mixtures, nerves and nurses, and on down to the latest information about vitamines. Catalog No. 39 covers animal industry, listing government research work in farm animals, dairying and poultry. "Tariff and Taxation" is a catalog for the student of government, while other lists include engineering and surveying, political science, birds, wild animals, and other subjects.

To get any of these public documents, the first step is to write to the superintendent of public documents, Washington, D. C., and ask for a catalog covering the particular subject in which you are interested. He will send the catalog free, and from it you can select the pamphlets you want. Your order must be accompanied then by payment at the price listed in the catalog, the remittance being either by postal or express money order, New York draft, or by coupons sold by the superintendent at twenty for $1.

The printing end of the business, which supplies the millions of booklets, is unique in many ways. It not only is the world's biggest printing plant, but it contains its own ink factory, a great book bindery, where everything from cheap machine casings to fine hand-tooled bindings are made, and its own department for marbling end sheets and edges. Two workers are kept busy at their unique trade, which is a jealously guarded family secret.



Book Marbler "Combing" a Tank of Floating Water Colors into an Intricate Design, and the Shipping Department Where Government Books Are Mailed to You

UNDERGROUND PARK FOR AUTOS TO AID TRAFFIC PROBLEM

Models of underground parking spaces for automobiles beneath city squares have been prepared in England to show what can be done to relieve congestion and help solve the garage problem for office workers. Vehicles would enter and leave on the "near" side of the street to make crossings unnecessary, and traffic within the "cellar" would circulate in but one direction to avoid confusion and accidents. Two exits and entrances are planned in case of breakdowns, and a signal system would indicate when the space is full. There is to be stairway communication to and from the surface for persons. It is proposed that the charge be based on the size of the cars as well as the length of time they occupy space. Washing and repairing autos would be forbidden in the subway, and strict safety regulations would be enforced.

Model with Section Cut Out of Top, Illustrating How Autos Could Be Parked beneath City Square to Relieve Street Congestion; Entrance Is Seen at Right

TEN-MILLION-DOLLAR AIR LINE TO CARRY LUXURY EXPRESS

Commercial aviation in the United States will enter the business field this fall with what is said to be the first large transport company in the history of flying to attempt service without government subsidies and without carrying passengers. It will be devoted exclusively to luxury express, articles such as motion-picture films, millinery and dressmaking goods, plans, blueprints, financial papers, insurance policies and rush repair parts, and, at first, will operate only between Chicago and New York. Branch lines will be extended to other cities later. A night schedule is proposed for west-bound planes. They will leave New York at late evening, arriving in Chicago early the next morning over a lighted airway. Analysis of cargoes carried by the United States air mail has convinced the supporters of the project that there is a need for such a means of transportation. They expect that the line will save costly delays in waiting for broken machine parts in factories, and will rush chemicals and other supplies to various consumers at a saving that will more than make up for the cost of the service.

FOLDING SEAT FOR TRAVELERS ALSO SERVES AS HANDBAG

Carried like a handbag and containing a mirror and a pocket for a handkerchief and other articles, a folding seat that will support safely the weight of the average person, has been invented in England. Its collapsible legs are concealed by the sides of the bag which inclose them when the seat is folded up.

Handbag Seat Extended with Covers Open, and Using Chair

LOUD SPEAKER WITHOUT HORN USES LIGHTING CURRENT

Clearer reception with less distortion of high and low notes is a chief objective sought in a cabinet loud speaker that has

Hornless Loud-Speaker Coil and Cabinet Front

no horn and is equipped with rectifier and amplifier units operated from the house-lighting circuit with alternating current. The diaphragm, a paper cone six inches in diameter, is vibrated by a wire coil that moves parallel to the face of the magnet poles instead of toward and away from them so that the distance it can be actuated is not so limited and hence a greater range of tone is possible. The edge of the cone opening is attached to a baffle board, which serves as the front of the cabinet, by a thin rubber membrane. This flexible connection premits such resonance that even extremely low tones are said to be faithfully reproduced.

USEFUL GERMS WORK FASTER UNDER COLORED LIGHTS

Useful microbes, such as those that aid fermentation in the preparation of alcohol for motor fuel, work at almost double their usual speed when under red lights, according to an English scientist. He also discovered that other germs, normally a bright orange color, turned green if grown under green lights and white if cultivated under blue rays.

¶Thin slabs of cork are used in Rome as a substitute for straw in making hats.

PORTABLE AIR-TURBINE MOTOR RUNS CLEANING BRUSH

For heavy work such as scaling ships or cleaning foundry castings, a steel brush turned by an air-turbine motor is furnished as a complete and easily portable unit that weighs only eleven pounds. The motor consists of only fifteen parts, exclusive of the screws, and the wheel, of forged steel, operates at 12,000 to 18,000 revolutions per minute and is mounted on ball bearings. Pressure is controlled by a hand trigger and the exhaust keeps the bristles clean.

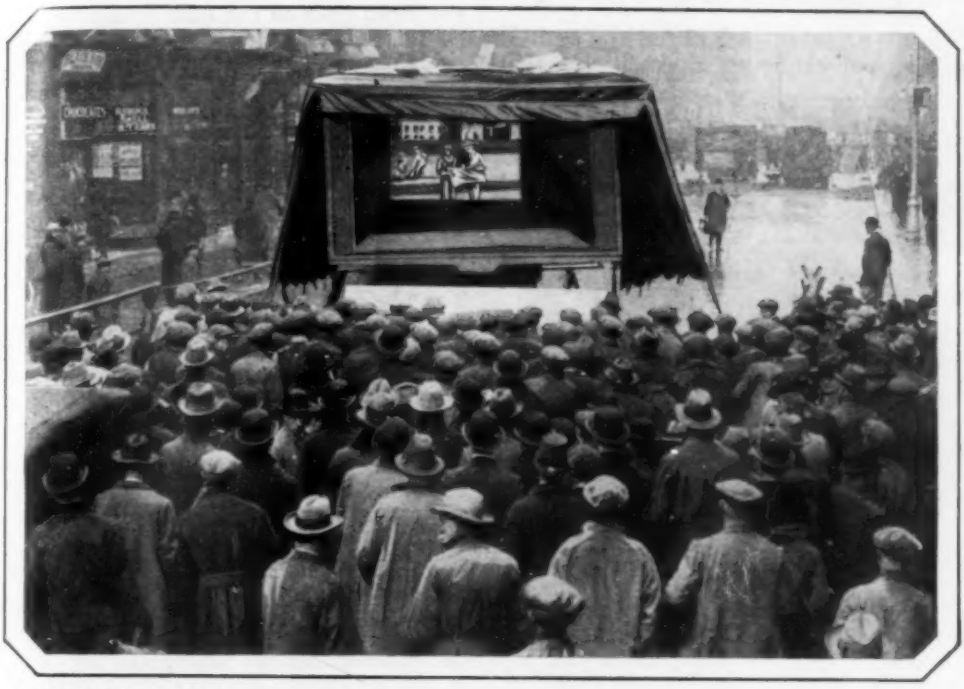
ELECTRIC RIFLE TARGET TELLS WHERE BULLETS HIT

Electrically operated rifle targets which do their own signaling and give the marksman not only his score but show the exact location of the hit on a five-inch board stationed at the firing point, are being used in Switzerland and France. The field target is made up of steel rings, strong enough to stop the bullets. Back of each ring are eight contacts against one of which the ring is forced by the striking bullet. An electric cable, leading from the field target to the firing booth, connects with the small indicator target on which the hits are shown the moment the bullet strikes. A shot hitting between two rings scores through the ring nearer the center of the target.

Courtesy La Science et la Vie

Bullets Striking the Steel Rings of This Target, Cause Them to Register Hits on Electric Indicator

DAYLIGHT MOVIES SHOWN IN STREET FOR WORKERS



Copyright Keystone View Co.

Watching Themselves Work: Employes of a London Street-Construction Company Enjoying a Daylight Film Projected within a Shaded Booth and Which Showed the Men Engaged in Pavement Building

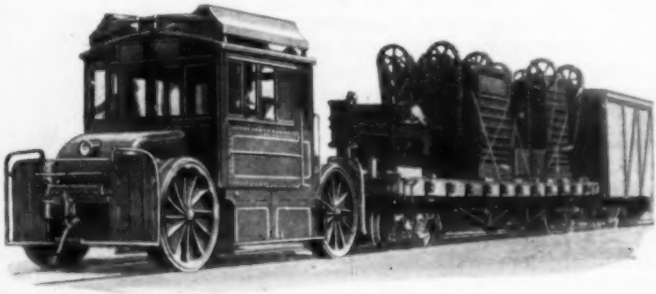
Motion pictures of workmen engaged in street construction were taken by a London company and then shown to them in daylight on a specially devised, shaded screen, erected on the pavement. The innovation increased the men's interest in their work and aroused lively comments among the actor-spectators.

HALF MILLION CATS AND DOGS TENDED IN FREE HOSPITAL

Since its opening nearly thirty years ago, an animal home in London has cared for nearly 500,000 lost or injured cats and dogs. As many as eighty are sometimes received in a single day, and the institution maintains a corps of searchers and a car that calls for patients in any part of the city. The service is free and is supported by voluntary subscriptions for the benefit of persons who cannot afford to have their pets taken to other hospitals. No animal is ever refused shelter and treatment in the institution.

RUBBER-TIRED TRACTORS PULL CITY FREIGHT TRAINS

Tractors are being used to move freight trains through city streets in Baltimore where steam locomotives are not permitted or their operation is too costly. The tractors have rubber tires and, being double-ended, work in either direction. The motive power is electricity generated by a direct-connected gasoline engine.



Rubber-Tired Electric Tractor Hauling Freight Train through City Street Barred to Steam Locomotives

SLIDING GRIP HOLDS BOARDS TO PLANE ON EDGE OR SIDE

For the convenience of the professional or amateur carpenter, a bench stop that

Bench Stop in Use and Detail Showing Slot to Hold Edges

holds boards on edge or flat when planing them, is adjustable to pieces of different sizes. Its principal feature is a patented slide that slips along a baseplate and grips the boards inserted edgewise so that they cannot fall to either side or move backward or forward. It takes pieces up to one and one-half inches in thickness, and those from three-sixteenths of an inch up are held fast, when flat, by a pronged grip that is adjusted with a setscrew.

OIL WELL LEAKS ARE FOUND WITH "WATER WITCH"

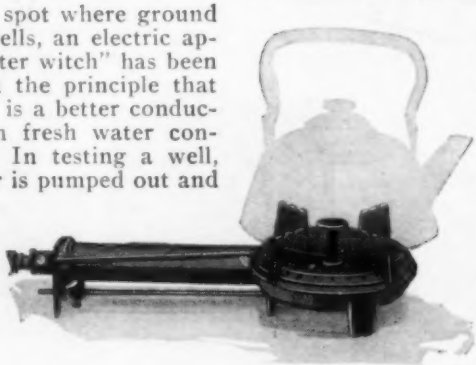
To locate the exact spot where ground water leaks into oil wells, an electric apparatus called the "water witch" has been devised. It works on the principle that water containing salts is a better conductor of electricity than fresh water containing no minerals. In testing a well, the salty ground water is pumped out and the shaft filled with fresh surface water. Two insulated wires with electrodes at their ends are then lowered and connected to a resistance indicator above ground. When the electrodes approach the place where salty water enters, the resistance decreases, and it is lowest when the exact spot of the leak is reached. It is said that the water witch finds leaks in a short time and that its use has resulted in the saving of much oil that otherwise would have been lost.

"GARDEN OF EDEN APPLE" TREE GROWS IN CEYLON

Trees that bear what the Mohammedans regard as "Eve's apples" flourish in Ceylon but are difficult to grow elsewhere. The blossom has a pleasant odor but the fruit, which resembles an orange on the outside and is a deep crimson within, is poisonous. The apples are dented as though a piece had been bitten out of them. Naturalists have been unable to explain this phenomenon. The Mohammedan belief is that the mark and the peculiar coloring of the fruit are warnings against its noxious properties.

LIFTING KETTLE CUTS OFF GAS ON AUTOMATIC BURNER

A considerable saving in gas bills may be effected by an automatically controlled gas-stove burner which cuts off the flame when a utensil is lifted off the plate. When the vessel is replaced, the heater, which is patented, lights up again. The pilot jet that ignites the gas requires only one lighting and eliminates the mass of burnt matches often found carelessly thrown about the stove. As only a small flame is needed for this purpose, the fuel consumption necessary for the light is very low. The automatic burner also does away with the risk of escaping gas which sometimes results when a forgotten flame is blown out by drafts. It also insures a moderate flow of gas, preventing harmful puffs and miniature explosions that occur when the flow is turned on suddenly.



Copyright, C. A. Oldroyd

Automatic Gas Burner That Lights When Kettle Is Placed on It and Goes Out on Removal

¶While the auto is a competitor of the railroads, the national automobile chamber of commerce estimates that the motor industry furnishes the railways an average of about 2,000,000 carload shipments each year.

MIND SECRETS SHOWN BY TESTS ON RATS

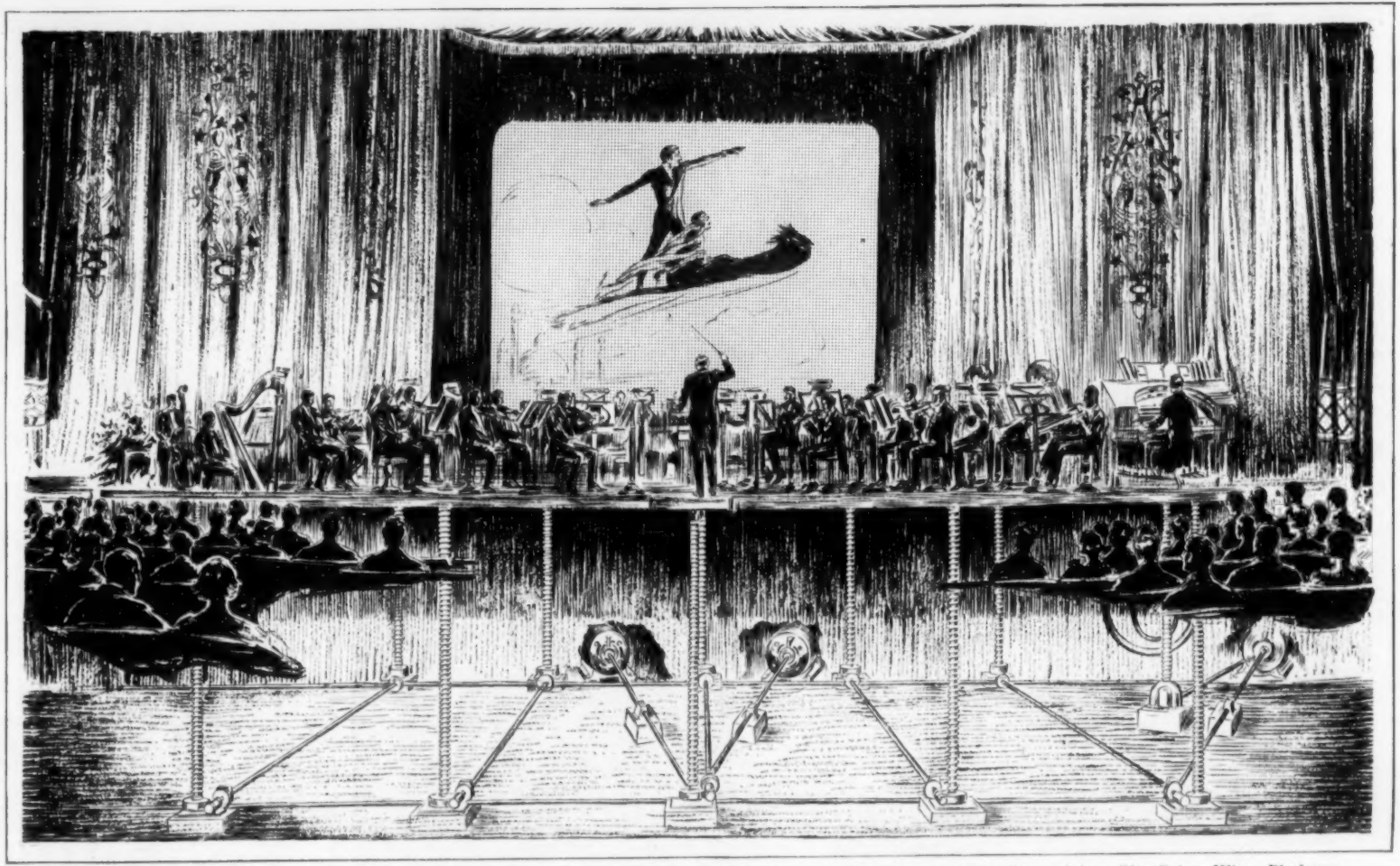
Striking similarities in the mental processes of animals and human beings have been revealed in a series of tests at the University of Chicago. White rats, it was found, learned to pass through a maze of passageways just as quickly and accurately as a person can feel his way through a similar labyrinth. This has been demonstrated by repeated comparative tests with the animals and human beings.

A glass-covered wooden box was used for the rats. They were placed in it, one at a time, and carefully watched as they crept along. In a few days, they learned to feel their way through the entire route to a bowl of bread and cream without retracing their steps or following any of the blind alleys, and reduced their running time from minutes to less than thirty seconds after only a few trials.

The rats learned this lesson, it is believed, by means of muscular sensitivity. Blind rats and those that had been deprived of the sense of smell made just as favorable a showing as the normal ones. Human beings learn the maze problem in the same way. They were tested with labyrinths similar to those found at amusement parks and with copper plates with surfaces that had been cut into a network of channels. The subjects were blindfolded and endeavored to trace the depressions with a pencil or a finger, guided by muscular impulses. It is this sense, scientists say, that tells us when we reach the top or bottom of a stairway in the dark. In certain memory tests, a rat seemed to remember the location where food had been placed for five seconds and a dog five minutes, but their memories were rather unreliable.

Scientists declare that every animal, down to the lowest one-cell organism, can learn something. This faculty, they say, seems to be a property of life itself.

Maze with Glass Cover Removed to Show Rat Partly through the Box; the Animals Feeding; Putting in Food Dish, and Comparative Test as Applied to Human Subject



Courtesy Balaban & Katz

Artist's Drawing of Lift Orchestra Stage, Showing Arrangement of Motor-Driven Shafting Geared to Worm Screws That Descend into Pits Below When Platforms Are Lowered; Organ, Director's Stand and Main Stage Are Separate Units

THEATER ORCHESTRA IS RAISED ON ELECTRIC ELEVATOR

An elevator that raises the entire orchestra to the level of the stage and several feet above the heads of the audience, has been installed by a Chicago motion-picture theater. While this is distinctly a novelty and produces an unusual effect, as the orchestra slowly draws into the brilliance of colored lights and the theater floor seems to be sinking as the players rise, it affords practical advantages over the ordinary pit. It places the musicians where neither they nor their lights can interfere with the line of vision of persons looking at the screen; far better results are given overtures and solo numbers, as the orchestra is lifted up where sounds cannot be hampered and the players are spared inconvenience in reaching their seats. They ride easily and silently to the floor level where they walk out to their dressing rooms. The lift was designed by Peter Clark and is built in three units, one for the thirty-five musicians and their instruments, another for the director and the third for the pipe organ. The three may be operated together or separately. The platforms are supported on screw jacks that are raised and lowered by electric motors through a system of connected shafting so arranged that the entire area of more than 600 square feet, with its unequal distribution of weight, is hoisted without vibration or noise, rising nine feet nine inches in two minutes. At the conductor's finger tips are controls that raise or lower any one or all of the stages when he desires.

GAS-TANK FILLER CAP SAVED BY BAR ON CHAIN

For any standard-size auto fuel-tank cap, a bar and chain holder keeps the top from falling into the dirt or getting lost when the tank is being filled. The crosspiece, which extends across the intake pipe, is six inches long so that it is not likely to slip out. The attachment does not interfere with pouring in gasoline and keeps the cap in convenient position for replacing after a filling.

TRAFFIC AND STREET LIGHTS COMBINED FOR SAFETY

Traffic-signal lamps being manufactured by an eastern company are combined with the street lights and suspended from brackets on the poles to give greater visibility both by night and day. The colored guide lamps, which flash automatically, are placed above the illuminating globe, across which an arrow may be attached to indicate a one-way street. The system leaves the center of the thoroughfare free from obstruction, and permits observance of the signals from the side as well as main channels. A noteworthy feature of the plan is a signal light by which street cars can be hailed by persons without stepping from the sidewalk. They press a button on the post, the light flashes as a flag for the motorman and also notifies autoists to stop so that the passenger can cross to the car in safety.

Sample Arrangement of Combined Street and Traffic Lights with Direction Arrows and Colored Lanterns

MICE SMALLER THAN BEES

Mice which are smaller than bees have been received at the London zoo from western Africa. The animals are so tiny that more than a dozen of them escaped from the container, during shipment, through a hole smaller than might be made by a lead pencil.

Time and Money-Saving Tools

Compact Electric Refrigerator That Also Makes Little Ice Cubes for Table Use

When the Carpet-Sweeper Brushes Become Clotted with Dirt, This Scraper Combs Them Quickly and Thoroughly without Injury; Right, a Steel-Disk Sharpener for Kitchen Knives That Screws to the Wall or Table and Requires No Skill in Producing Keen Edges

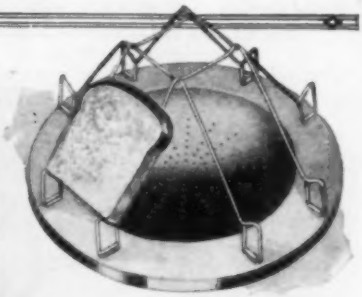
Non-Tipping Safety Cart for Children Has Three Wheels

Clamps Fit the Clothes Wringer to the Bathtub, Saving Stooping; Below, Tea Caddy That Shakes Out One Spoonful at a Time

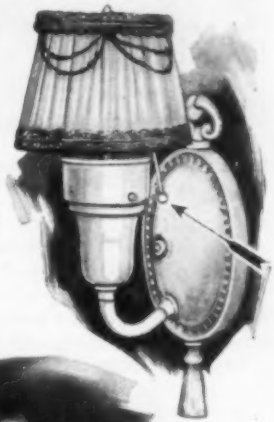
Anyone wishing further information on devices described in the editorial pages can

for Woman's Workshop in Home

Healthful Sleep Is Assured in Window Tent with Regulating Ventilator



Folding Toaster Shuts Up Flat to Save Camping Kit Room



Arrow Points to Lever That Gives Four Degrees of Light in This Current-Saving Wall Lamp

Time Is Saved in Preparing the Salad Dressing with Beater Run by Water from the Kitchen Faucet; Dish Is Secured by Side Clip, and Funnel Holds Liquids for Mixing the Contents to Proper Thickness

Rubber-Tired Bath Cabinet, a Woman's Idea for the Baby, Is Correct Height to Save Lifting and Bending Over, Has Space for Clothing and Towels, to Spare Needless Steps, and Is Easily Moved About

obtain it by addressing Bureau of Information, Popular Mechanics Magazine, Chicago.

"BOOSTER" ON AUTO GREASE GUN SAVES TIME AND LABOR

Attached directly to the grease gun used for lubricating springs of the automobile,

Lever "Booster" on Grease Gun to Increase Force and Save Work in Lubricating Car

a "booster" appliance has been devised which is said to increase the amount of pressure three times and save the operator the task of applying all the force by turning the regular gun handle. It has a compound-lever action and is said to develop a force of from 3,000 to 3,800 pounds, depending upon the strength of the user.

SECRECY ON PARTY-LINE PHONE AT TOUCH ON BUTTON

Elimination of listening-in on rural and party lines has been achieved by an invention tested in Canada. By simply pressing a button, the caller on the telephone system equipped with this appliance can prevent any one except the person called from listening to the conversation. The invention is designed to insure the secrecy long desired in connection with rural and party-line service. The lockout apparatus, as the telephone engineers call it, is simple in character and can be installed at nominal cost.

RARE BIRDS, BEASTS AND FISH FOUND OFF MEXICO

Several hundred specimens of rare animals, birds and fish including two "Boobies," a variety of sea bird whose four toes are all joined with a web, were brought to the United States recently on the mine sweeper "Ortolan," after a cruise through waters off the coast of Lower California and western Mexico. On one of the small islands, the scientists found a number of wild sheep which are believed to have sprung from a small herd left there by the French in the middle of the last century. Another could not be visited, as its steep cliffs rose 110 feet from the sea and high waves beating upon it made a landing attempt too hazardous.

CYCLIST PRACTICES LONG JUMP OVER MEN AS HURDLES

While training for an exhibition in motorcycle broad jumping, an English rider used four men as hurdles. For their safety as well as his own, he took pains to get a good take-off so that he would rise to a sufficient height to clear the men's heads as they reclined on the ground and land well beyond the last man. This novel form of training was said to give the rider greater steadiness of nerve and self-confidence.

Human Hurdles Submitting to Hazardous Task While Rider Practices Long Jump over Their Heads on Motorcycle; Trials of This Sort Improved His Style and Skill for Exhibition

Copyright, Keystone View Co.

Model of Elevated Stairways for Passengers Proposed for Erection in Potsdamer Platz, Berlin, to Relieve Traffic Congestion and Eliminate Delays; Vehicles Circle Continuously beneath Them

RAISED WALKS IN BUSY SQUARE TO RELIEVE CONGESTION

Elevated sidewalks, leading from the streets to the center of the square, have been proposed as a solution of the traffic problem for Potsdamer Platz, one of the busiest centers in Berlin. Under this plan, the main thoroughfare will be left to vehicles, pedestrians will be protected, and there will be practically no delay in getting from one street to another.

DIESEL MOTOR AS AUTO POWER FORECAST TO SAVE FUEL

Diesel engines, already widely adopted for steamer and locomotive power, will soon take their place on farm and commercial tractors and trucks in the United States, according to an automotive engineer. Within the next ten years, they will be in use on automobiles, he predicts. Foreign manufacturers already have developed successful Diesel types for motor busses and tractors. Higher costs of fuel in Europe largely explain why greater strides have been made in this direction abroad than here, for the Diesel effects great economies in fuel consumption. It differs from the ordinary engine in its manner of ignition. The usual automobile motor sucks in gasoline on the downstroke of the piston and relies upon a spark to explode it and develop power. The Diesel sucks only air on the downstroke. When the piston comes up, it compresses the air until it is "red-hot," igniting a jet of atomized fuel which explodes and forces the piston down.

STENCIL GUIDE FOR NECK SHAVE SAVES USING MIRROR

Self-administered neck shaves are simplified with the help of a celluloid stencil that fastens to the back of the head with strings and a clasp and has slits in the edge to guide the razor. The accessory makes a mirror unnecessary and can be used both for the side and rounded styles.

Neck-Shaving Stencil in Position; the Edge Guides Razor to Trim Neatly

Protecting the Nation's Food Supply

By ROBERT H. MOULTON

PROTECTING the food supply of the nation is a co-operative job for the food officials of the federal, state and municipal governments and the housewives of America. At one time it was the sole job of the housewife. That was when she prepared in the home nearly all the food she served.

With the evolution of the food industry, more of the work in the preparation of food has been transferred from the home to the factory, and now the housewife cannot know just what goes into all the packages of the various kinds of foods she buys.

It requires a chemist and a completely equipped laboratory to analyze the foods and determine what enters into their composition. Factories where foods are prepared must be inspected to see that the foods are put up under sanitary conditions, and that proper processes of sterilization and suitable raw materials are used. Then samples of the foods that are put on the market must be collected and legal evidence gathered to check adulteration and misbranding.

Since the enactment of the federal food and drug act, 12,000 prosecutions based on the adulteration or misbranding of foods and medicines have been completed and the result of each published. Eggs alone have been the basis of no less than 600 seizures and prosecutions. Included in this number are cases involving shipments of dried and frozen eggs which are used extensively by commercial bakeries, hotels and restaurants. The majority of the cases were based upon the shipment in interstate commerce of shell eggs, some of which were spoiled.

More than a hundred cases have been brought because of adulterated or misbranded flour including barley, buckwheat, corn, gluten, graham and rye flours. In the case of wheat flour, the charges most frequently made were excessive moisture and short weight.

Dairy products, such as butter, cream, milk, cheese, ice cream, condensed and powdered milk, were involved in more than 1,000 court actions. Where butter was involved the most common charges were deficiency in butterfat and shortage of weight. Milk was found to contain added water, to be skimmed, or to be contaminated with bacteria.

Canned tomatoes, tomato catsup, tomato pulp and other tomato products also have occasioned many actions. Hundreds of shipments of these products have been seized in various parts of the United States on the charge that the products were made in part of decomposed

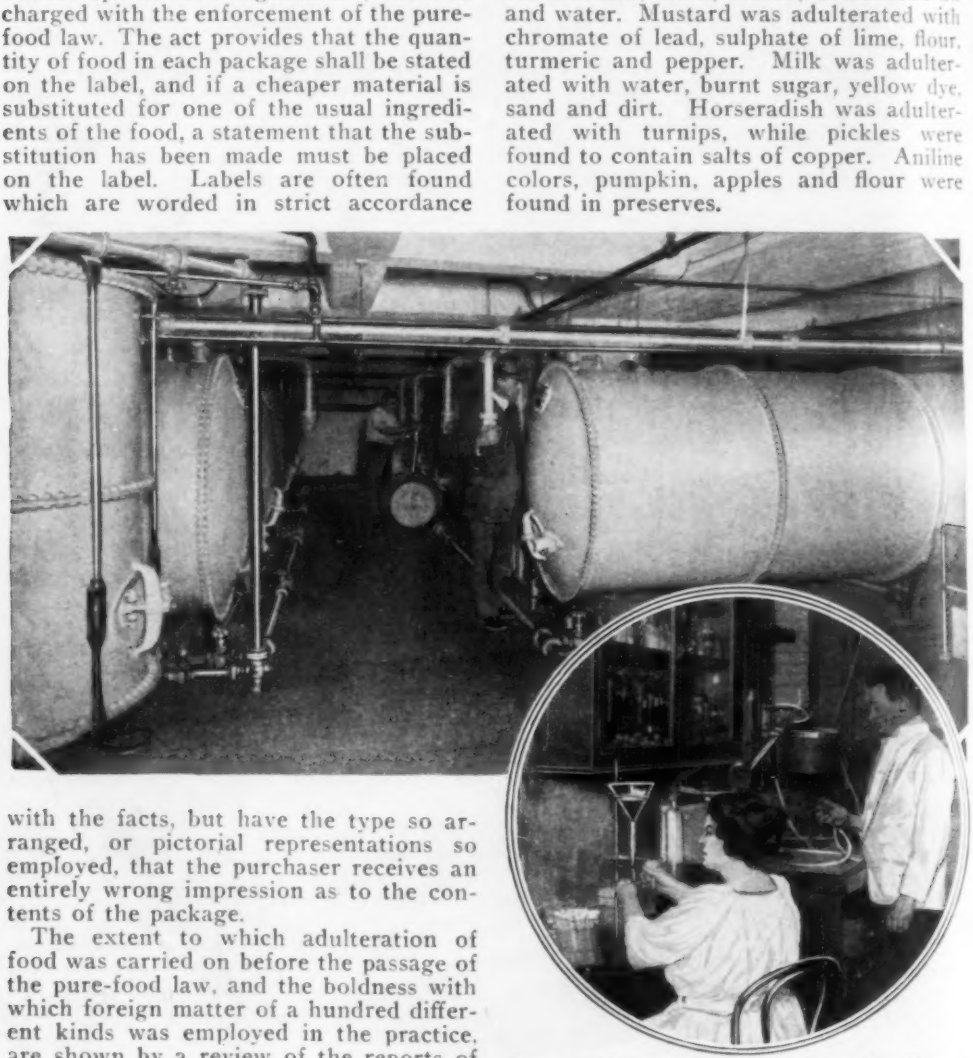
Part of the First-Line Defense against Food Contamination, Inspectors Examining Goods at a Public Market for Decayed or Poisoned Perishables and Other Produce That Might Cause Disease; Another Scene of the Inspection Service Is Staged in Laboratories of the Department of Agriculture's Bureau of Chemistry Where Drugs Are Analyzed to Determine if Their Contents Agree with the Labels on the Bottles

tomatoes, contained added water, were short weight or were misbranded in such a way as to mislead purchasers.

The substitution of cottonseed oil in whole or in part for olive oil is another form of adulteration that persists on the part of some dealers in spite of hundreds of seizures and prosecutions. Cottonseed oil is an excellent, wholesome product, having a well-deserved and extensive market on its own merits. But since it is cheaper than olive oil, its sale as olive oil at a higher price than it would command under its own name is a fraud.

"Read the labels on all food packages," is the advice of the bureau of chemistry of the department of agriculture, which is charged with the enforcement of the pure-food law. The act provides that the quantity of food in each package shall be stated on the label, and if a cheaper material is substituted for one of the usual ingredients of the food, a statement that the substitution has been made must be placed on the label. Labels are often found which are worded in strict accordance with the facts, but have the type so arranged, or pictorial representations so employed, that the purchaser receives an entirely wrong impression as to the contents of the package.

The extent to which adulteration of food was carried on before the passage of the pure-food law, and the boldness with which foreign matter of a hundred different kinds was employed in the practice, are shown by a review of the reports of the examination of foods found in the markets made by the bureau of chemistry. Bread was found to be adulterated with sulphate of copper and with inferior flour, while butter was found to contain copper, excess water, excess salt, other fats and starch. Ground coffee was adulterated with chicory, peas, beans, acorns, nut shells and burnt sugar. Cocoa and chocolate contained oxide of iron, animal fats, coloring matter, starch and flour. Cayenne pepper was adulterated with red lead, rice, flour, salt, Indian meal and oxide of iron. Alum, ground rice, grit and sand were used to adulterate flour. Turmeric, cayenne pepper and mustard were found in ginger. Lard contained caustic lime, alum, starch, cottonseed oil and water. Mustard was adulterated with chromate of lead, sulphate of lime, flour, turmeric and pepper. Milk was adulterated with water, burnt sugar, yellow dye, sand and dirt. Horseradish was adulterated with turnips, while pickles were found to contain salts of copper. Aniline colors, pumpkin, apples and flour were found in preserves.



Inspecting Olive-Oil Plant, and Making Germ Tests on Food Products in Laboratory

BETTER RADIO TONE IS GIVEN BY DOUBLE BROADCASTING

Putting radio into the "third dimension," so that broadcasting conveys not only the sense of tone volume and harmony, but likewise the location of the various instruments in the orchestra, or other source of sound, is accomplished by a new system of broadcasting, which employs double transmitting and receiving sets. Two microphones, spaced a few inches apart, pick up the music and broadcast it on different wave lengths. The listener with a double receiver tunes one unit to one wave length and the other to the second, and listens through a headset. The result is that one ear hears the sounds transmitted from one microphone, and the other ear hears those from the second transmitter. The two microphones being a few inches apart do not pick up the same volume of sound from each instrument, but transmit just enough variation in sound as to convey to the listener a sense of the location of each instrument. The result is a much more faithful reproduction of the original music than is possible with ordinary broadcasting, according to Dr. F. M. Doolittle, of Yale University. Any listener with an ordinary receiver can listen to this station on either one of its wave lengths, just as he would to any other broadcaster but only those with the special double equipment can hear both transmitters at once. The system lends itself only to use with headsets, since the loud speaker defeats its purpose of localizing the sound in either ear.

"DEADLIEST RAY" IS REPORTED

Said to be more destructive than any previous invention of its kind, a new death ray discovered by a German has an effective ground range of forty miles and operates to an altitude of more than 45,000 feet. Men and animals are rendered unconscious by the mysterious force of its waves the paralyzing influence lasting for six hours, according to reports to the department of commerce.

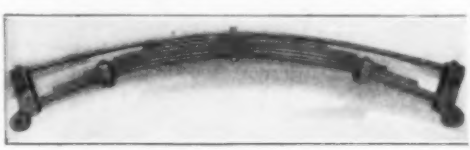
SLED-WAGON MAKES TRAVEL SAFE ON ROUGH TRAILS

For hauling tourists' baggage over rough, winding trails in the Glacier National park, a horse-drawn cart with runners in front and rubber-tired wheels in the rear, grips the road on steep descents and does not capsize on slanting places. Built low and narrow, it is easily loaded and unloaded and is well adapted to wooded areas where but little clearing has been done. In operation, most of the weight is shifted upon the wheels.

Baggage-Laden Cart Ready for Rough Paths; Runners Keep the Load to the Ground and Wheels Ease the Horse's Burden

MASTER LEAF ON AUTO SPRINGS PREVENTS JARS AND BREAKS

Automobile springs are said to be protected from breaking and the car is made to ride more comfortably by the addition of a master leaf attached to the center of the springs and resting in slotted shackles at each end. This arrangement is designed to take up most of the recoil and road shocks before they reach the spring proper. The shackles permit the long leaf to move up and down and hold it in place.



Auto Spring with Master Leaf Fitted into Side Shackles to Relieve Jars

Night Scene at Busy Sawmill Where Electric Lights on Grounds and in Buildings Dispel Darkness for the Workmen; Tapering Reflections Are Mirrored in River Near By

WIRE NETTING OVER MANHOLE GUARDS AGAINST ACCIDENTS

As a precaution against accidents to pedestrians, automobiles and laborers, wire screens are placed over open manholes in a western city while repairs are being made. They are strong enough to bear the weight of an auto, and prevent anything from falling into the hole and injuring those inside. The protector is hinged so that it can be folded into small space and is easily carried and set up.

Folding Screen Cover for Manholes That Guards Autos and Workmen Inside as Well

SAWMILL'S BRILLIANT LIGHTS PERMIT WORKING AT NIGHT

With the aid of an elaborate system of powerful electric lights, strung through shops and yards, a large lumber mill in a western city is able to run three shifts, and work goes on at top speed at night just as in daytime. The illumination has been arranged to eliminate danger of darkened passages and corners in all parts of the plant, and a large beacon on top of one of the 300-foot smokestacks of the power house also serves to guide traffic in the river near by.

RUSTLESS ALLOY FOR PLATING GIVES HARD SURFACE

A process has been discovered for electroplating metals with an alloy composed principally of chromium, a substance ranking next to the diamond in hardness. According to reports, the compound produces a surface of such hardness that softer metals, when plated with it, take on the surface-wearing qualities of extremely hard steels that are more expensive and difficult to machine. It is also asserted that the finish is twenty times as lasting as zinc and gives a stainless surface that will not tarnish, rust or be affected by acids. Among the thousands of articles treated with the chromium alloy and exposed to the elements, were golf clubs which remained bright after months of use. A chromium-plated tablespoon, left immersed in milk for seven months, was not affected by the lactic acid in the decomposed milk.

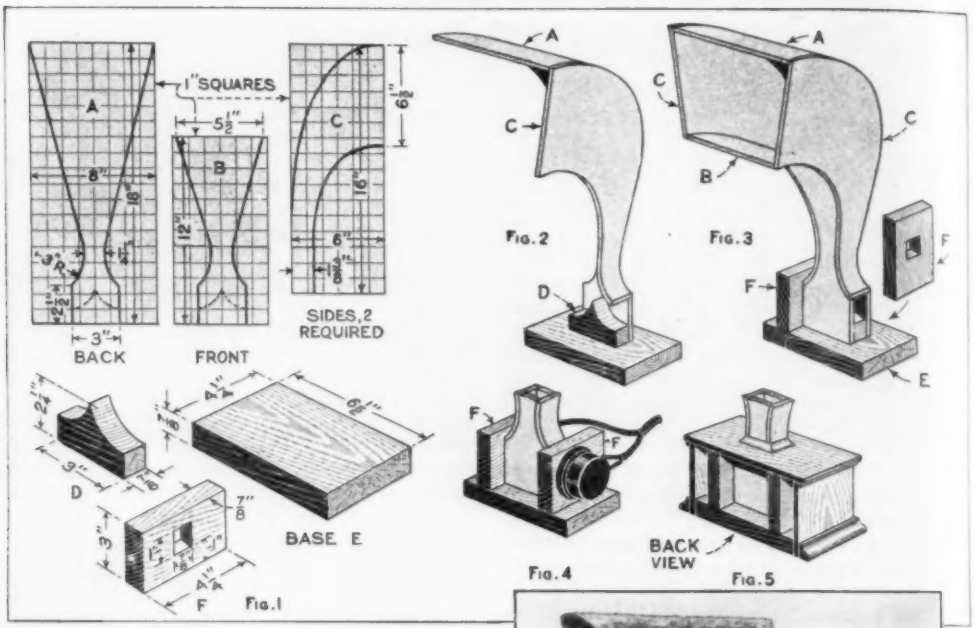
Making Loud Speaker from Headset

By WILL H. BATES

ALTHOUGH many radio enthusiasts are satisfied with head-phone reception for a long time, a loud speaker has so many advantages that one is provided sooner or later, especially if the receiving set is capable of giving loud-speaker volume. Where, however, it is not desired to purchase a loud speaker, a good one can be made at home, using the head phones instead of a regular loud-speaker unit. The one shown in the illustrations was made from pieces of wood and wallboard, and the total cost was only about 25 cents. The base holds the head phones, which give enough volume for any ordinary size room. Such a loud speaker is entirely satisfactory for a small receiving set, which cannot supply enough energy to operate a regular loud speaker. The method of cutting and assembling the base and attaching the horn is clearly indicated in the drawing and the arrangement of the head phones inside of the base is shown in the photo.

Cut sections A and B and two sections C, according to the dimensions given. A sharp knife can be used for this purpose, although a coping saw will be found more convenient. The small block D is cut out of a piece of ⅞-in. wood, 3 in. long, 1 in. high at the ends and 2¼ in. in the center. Glue this block to the bottom edge of section A, which is the back of the horn. Then soak the top parts of sections A and B, and the lower parts of sections C, and spread liquid glue along the edge of each. Bend section A to follow the outer curve of C; tack the two top corners together, and drive tacks or brads at intervals of an inch or two down to the bottom. This will require careful work, especially if thin wallboard is used, and it will be found that ordinary pins will work better than brads, as they are not so apt to split the board, and the heads hold better. The lower end of section C curves outward at the bottom, and, if found too long, should be cut off flush with the edge of section A. Now fit the other section C to the other side in the same manner. Spread some glue on the face of section D and fit in the front section B. Start fitting

Any Boy Can Make a Head-Phone Loud Speaker of This Type at a Small Cost. It Is Finished in Polychrome and Makes an Attractive Addition to the Set



Patterns of the Wallboard Horn and the Details of Construction and Assembly. Photo Shows How Head Phones Are Inserted in the Base

this section in from the bottom, so that in case it should come out a little too long, it can be cut off at the top. When the horn has dried out it should be quite firm and rigid if plenty of liquid glue has been run into the seams after joining the sides. Next, cut out the baseboard E of ⅞-in. lumber, and mount the horn in the center of this in an upright position, as shown in Figs. 2 and 3. A long, slender screw from the underside of the baseboard will hold block D on securely. Cut the two small sections F, either out of wallboard, or from wood as shown in Fig. 1. The opening in the center is 1 by ⅞ in., starting 1 in. from the base line. Tack one of these to each side of the base of the horn, seeing that the square openings come directly over the openings leading into the horn. If no better finish is desired, the phones can be clamped over these openings by means of the headband and the horn is ready for use as shown in Fig. 4. However, for a more finished effect, the lower part should be boxed in. Out of cigar boxes, cut a front and two sides to fit around the edges of the base, coming up as high as the top of the sections F. After these pieces have been tacked in place, lay in a top piece, which will have to be cut to fit around the neck of the horn. Finish with most any kind of molding around the base of the box, and also around the neck of the horn. The

back is left open so that the phones may be slipped into the two little compartments, the headband being disconnected. The inside of the compartments holding the phones should be lined with felt or velvet. If the space is too large for narrow phones, the ends of the boxes can be padded to make the phones fit tightly.

Sandpaper the rough edges of the horn and the box. A polychrome finish is now applied. Get a small can of the preparation used in plastic art work, which is so popular at present. This is a sort of thick paint or clay. If unable to find any of these preparations, a thick mixture of good calcimine powder, a little plaster

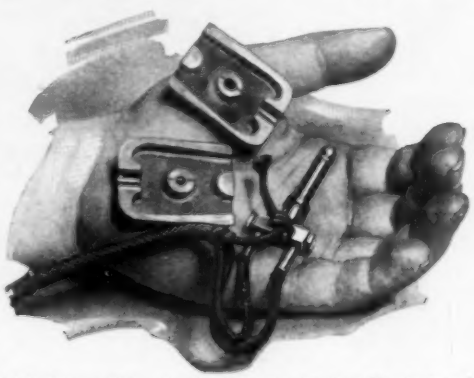
of paris, and some liquid glue, can be used to get a similar effect. Daub this on the surface in a very rough way, running it into the seams of the horn. While still wet, pounce this with a stiff brush to give it a rough, pebbled surface. After it is dry, go over the entire surface with a coat of gold bronze paint, which is made by mixing bronze powder in banana oil. This will dry in a few hours, and a green or brown oil color is then applied. Allow this to stand until it gets sticky or tacky. Then with an old rag wipe off most of the surface color. The gold paint will show through on the raised portions, while the other color will fill the indentations.

Renewing Panel Markings

When the set has been in use for some time, the markings on the panel and dials lose their whiteness, and this detracts from the appearance of the set. The "newness" may be restored in a very simple manner by the use of a little Chinese white, a tube of which can be obtained at any art store. Rub the paint over the markings of the dials and on the panel, working across the marks rather than along their lines. When the paint has dried it may be rubbed off with a rag, leaving the marks filled with paint. It may be necessary to dampen the rag.

Extra String Protects the Cord Tips

Many radio fans doubtless have noticed a little piece of string between the cords on the phone or loud-speaker connection and have, perhaps, cut it off as it seemed to be in the way and to serve no useful purpose. The string was put there, however, to protect the metal tips at the ends. It is to be tied to the plug so that, when the connection is pulled out, the strain will not come on the tips. The illustration shows how the string is adjusted.

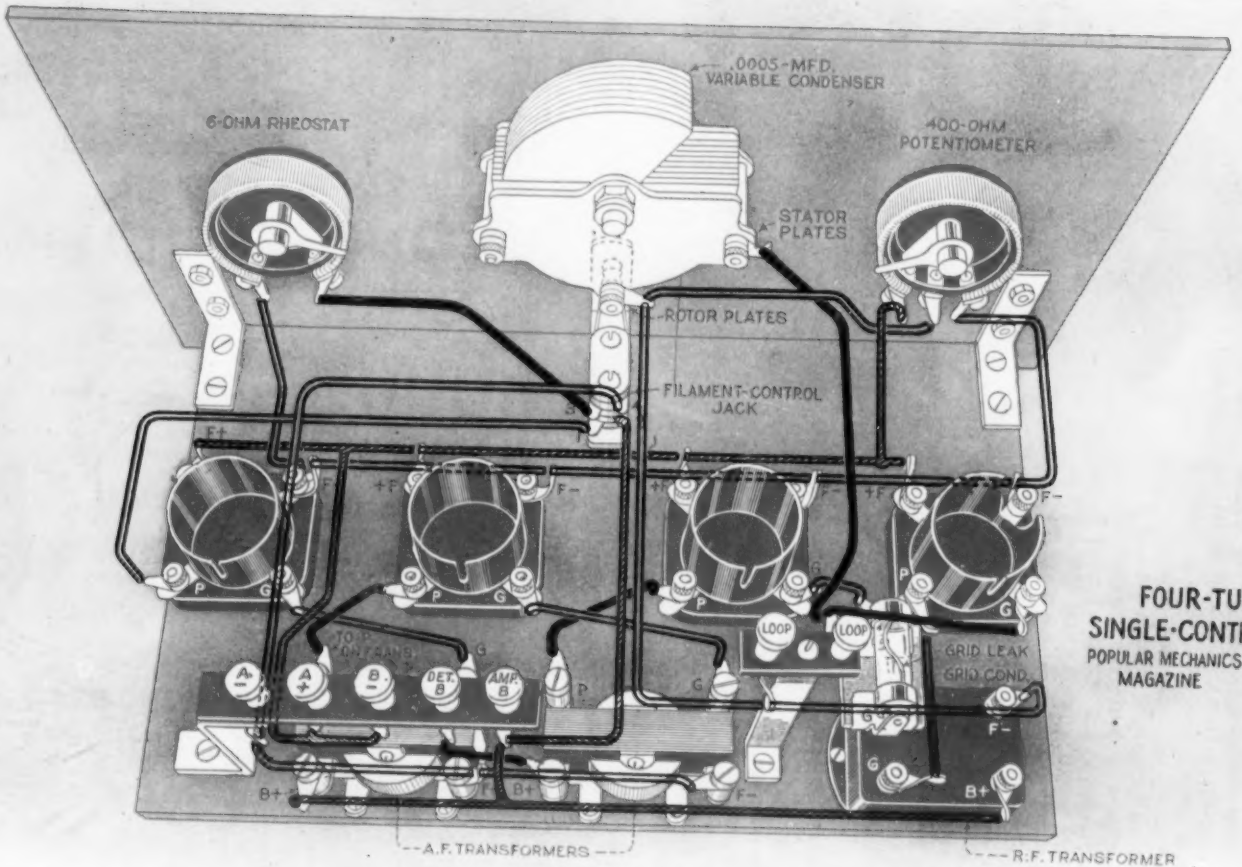


This Shows How the Cord on the End of Headset and Loud-Speaker Cords Protects the Wires

Charger with Non-Reversible Terminals

It is impossible to reverse any of the connections to one of the battery chargers now on the market. The charger contains two 75-ohm resistance units and two rectifying jars, employing an alkaline salt solution, with aluminum and iron electrode rods. Fahnestock clips are used to attach the wires to the electrodes, but one clip is soldered to the electrode itself, while the other clip is attached to the wire, and the electrode ends in a metal point over which the clip slips. A lead with one-half of a pull-apart plug is attached to the A-battery terminals of the set, and the other half of the plug goes to the battery. A third half-plug is built into the front of the charger so that to charge, it is only necessary to pull out the plug to the set and plug the battery half into the charger. The plugs have contact points of different diameters, and can only be fitted together in one way, making it impossible to reverse the polarity.

The Pull-Apart Plug on the Front of the Charger, and the Fahnestock Clips on the Rectifying-Jar Electrodes Are Non-Reversible



FOUR-TUBE SINGLE-CONTROL SET

POPULAR MECHANICS MAGAZINE AUGUST 1925

Exceptional Four-Tube Loop Receiver

By E. R. HAAN

ONE of the most selective receivers ever built in Popular Mechanics radio laboratory is a simple, cheap, four-tube loop set, which has only one tuning control, making it extremely easy to operate, and the whole set is contained in a cabinet 12 in. long. Besides showing remarkable selectivity, it has also been found very sensitive and has a splendid tone quality. While half a dozen Chicago stations were broadcasting at full blast, it was really a surprise to hear outside stations come in on a loud speaker without any interference.

The circuit used here is simply the ultra-audion adapted to a loop, putting a stage of radio-frequency amplification ahead of the detector, and feeding the plate output of the first tube back into the loop in practically the same way as it is fed back into the outside aerial, in the usual ultra-audion hookup. Only this feed-back line is not connected to the plate terminal on either the socket or the radio-frequency transformer, which would make a short circuit if used with a loop, but the inductive method of coupling is used, the feed-back line being connected to the secondary side of the radio-frequency transformer. This gives a greater feed-back than the other method and makes the use of a loop possible. Two stages of radio-frequency amplification were also tried with the same method of regeneration, but this made the tuning broader and did not add much to the sensitiveness and volume. On four tubes the volume of locals on a loud speaker was really too great and had to be reduced for comfort.

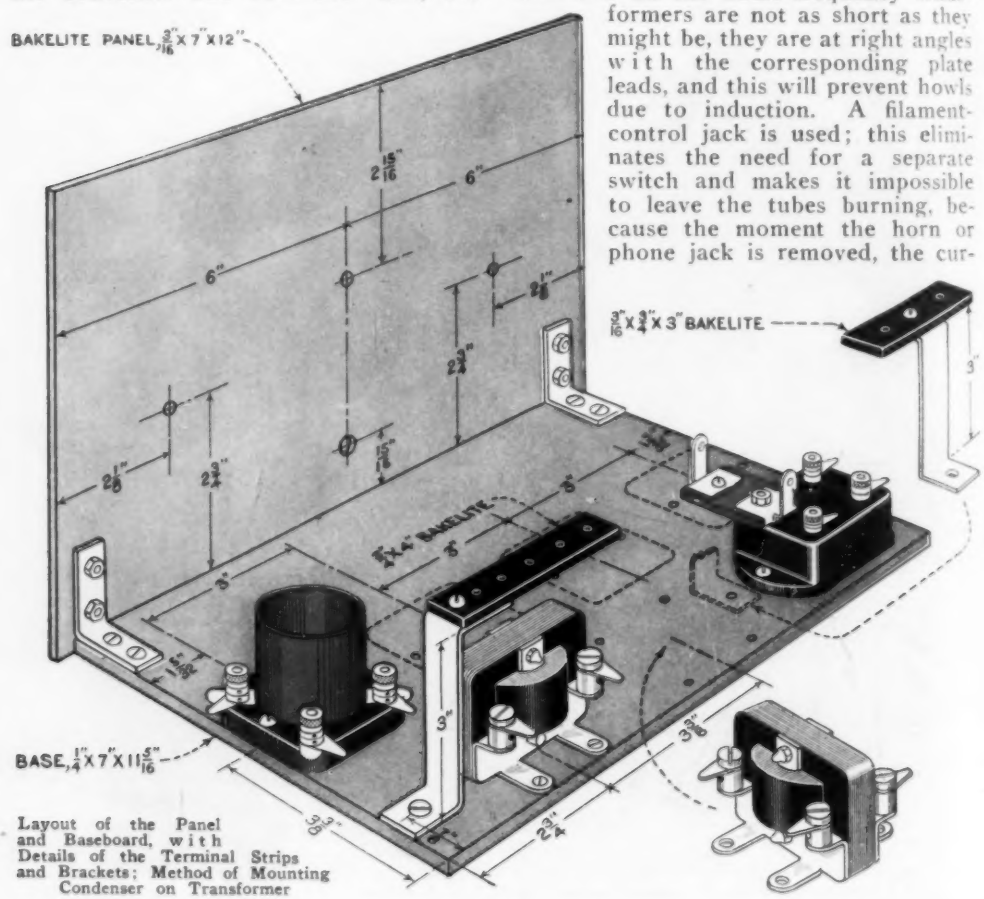
One reason for the sharp tuning of this set is the use of a tapped loop. An outside aerial cannot be used at all and an ordinary loop is not satisfactory. When the whole inductance of the loop is used by setting it on the last tap, or when an ordinary untapped loop is used, the full 180-degree range of the tuning condenser varies between wave lengths of 370 to 550 meters, and stations, operating on lower

Small, Inexpensive Receiving Set, Which Operates on a Tapped Loop and Gives Tremendous Volume on a Loud Speaker. It Is Very Selective

Copyright, 1925, Popular Mechanics Magazine

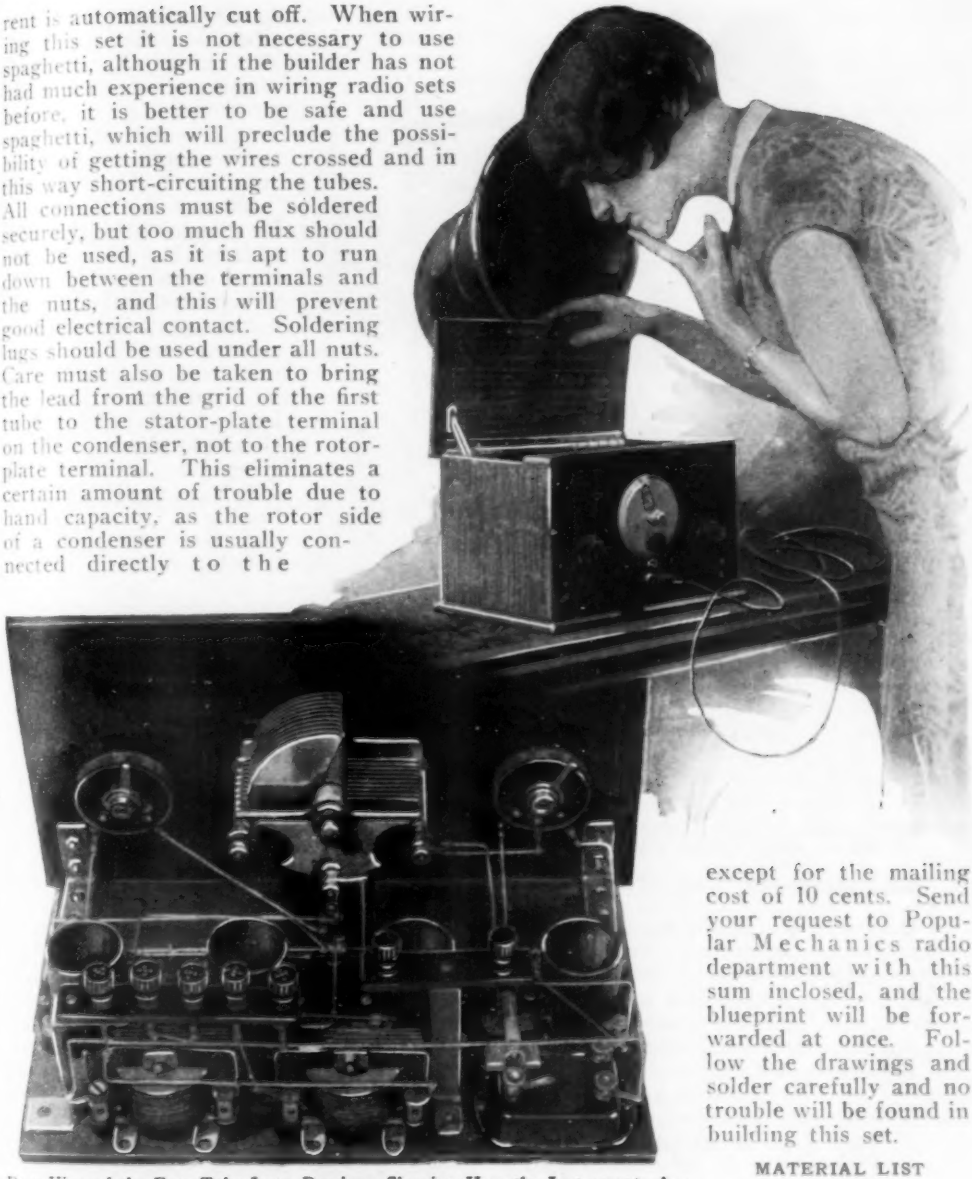
wave lengths cannot be brought in at all. When the second to the last tap is used the condenser range varies between 225 and 400 meters, effectively cutting out all stations on higher wave lengths. This method of tuning brings in the stations at points farther apart on the dial than usual, and enables one to tune much closer. When located 4 or 5 miles from a station the dial has to be set exactly on the dot to bring the station in, and any squeal can then be eliminated by means of the potentiometer. Incidentally the volume can be controlled entirely with the potentiometer and, also, of course, with the rheostat. Either a 21 or 23-plate condenser can be used, the latter being preferable. All tubes are of the 201-A type, and the maximum current passed by the set is only 1 ampere. Any good audio-frequency transformers can be used, but only the very best radio-frequency transformers.

The panel is first laid off and drilled for the condenser and condenser dial, the rheostat, potentiometer, jack and two angle brackets. Measure the distances carefully and prick-punch the centers of the holes before drilling. The exact size of the holes varies with the make of instruments used. It is a good idea to drill small holes and enlarge them by means of a hand reamer to accommodate the instruments. A standard panel 7 by 12 in. is used. The dimensions of the baseboard are given and also the exact location of all the instruments on the baseboard. The grid condenser, of the type indicated, is attached on the G-post of the radio-frequency transformer and the other side of the condenser is connected to the G-terminal on the detector socket in the usual way. In the illustration a separate binding-post strip is shown to accommodate the loop terminals. If desired these binding posts can be placed on the other binding-post strip. Although the grid leads from the second and third tubes from the right to the grid terminals on the audio-frequency transformers are not as short as they might be, they are at right angles with the corresponding plate leads, and this will prevent howls due to induction. A filament-control jack is used; this eliminates the need for a separate switch and makes it impossible to leave the tubes burning, because the moment the horn or phone jack is removed, the cur-



Layout of the Panel and Baseboard, with Details of the Terminal Strips and Brackets; Method of Mounting Condenser on Transformer

rent is automatically cut off. When wiring this set it is not necessary to use spaghetti, although if the builder has not had much experience in wiring radio sets before, it is better to be safe and use spaghetti, which will preclude the possibility of getting the wires crossed and in this way short-circuiting the tubes. All connections must be soldered securely, but too much flux should not be used, as it is apt to run down between the terminals and the nuts, and this will prevent good electrical contact. Soldering lugs should be used under all nuts. Care must also be taken to bring the lead from the grid of the first tube to the stator-plate terminal on the condenser, not to the rotor-plate terminal. This eliminates a certain amount of trouble due to hand capacity, as the rotor side of a condenser is usually connected directly to the shaft, which projects through the panel, and to which the tuning dial is attached, allowing little space between the hand and the shaft. In the wiring diagram it looks as if the plate of the third tube is connected to the A-positive binding post, but the projecting lug is the one on the P-terminal of the second audio-frequency transformer.



Rear View of the Four-Tube Loop Receiver, Showing How the Instruments Are Located in This Compact Set

If you wish a large blueprint to work from you can get one free of charge, except for the mailing cost of 10 cents. Send your request to Popular Mechanics radio department with this sum inclosed, and the blueprint will be forwarded at once. Follow the drawings and solder carefully and no trouble will be found in building this set.

MATERIAL LIST

1 tapped loop.
1 7 by 12-in. cabinet.
1 7 by 12-in. panel.
1 7 by 11½-in. baseboard.
1 23-plate low-loss, variable condenser.
1 vernier dial for condenser.
1 400-ohm potentiometer.
1 6-ohm rheostat.
1 filament-control jack.
1 .00025-mfd. grid condenser.
1 2-megohm grid leak.
4 sockets, standard type.
1 radio-frequency transformer.
2 audio-frequency transformers.
4 201-A tubes.
7 binding posts.
2 angle brackets.
4 oval-head, nickel-plated screws.
wood screws, wire, solder, etc.

B-Battery Eliminator Capable of Supplying Eight Tubes at Voltages of 18, 45 and 90; Insert, Eliminator with Jar and Element Removed

B-Eliminator for Eight-Tube Set

A B-battery eliminator capable of carrying eight or more tubes without pulling the voltage down below 90, has been placed on the market by a Chicago concern. The eliminator uses an alkaline solution for a rectifying agent to change the alternating current in the electric-light line to direct current, and fixed condensers and transformers as a choke to reduce the voltage to the desired amount.

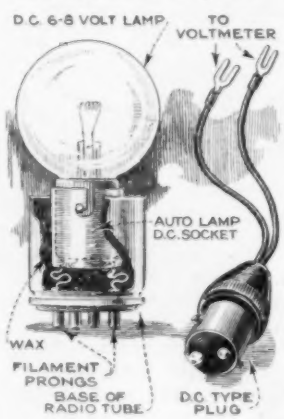
It is equipped with four taps, giving three circuits of various voltages. The 90-volt circuit is the direct output of the eliminator, while the other two are reduced by use of resistance units. They will give anything from zero to 65 volts on a hard detector tube or from zero to 35 volts on a soft tube.

In actual tests, using a 110-volt, 60-cycle lighting line for the source of power, the eliminator gave 123 volts without a load, and 103 volts when loaded with eight tubes. Two rectifying jars are used, with aluminum and lead electrodes, while the liquid is a saturated solution of ordinary borax. An extra supply of aluminum electrodes is furnished for replacements every three or four weeks, when the solution is also changed.

For small sets a similar eliminator, only half as large, is made. It has three taps, giving a 90-volt circuit and a detector circuit ranging from zero up to 35 volts on a soft tube, or to 65 on a hard tube. Like its larger brother, the small eliminator has two rectifying jars, only one of which is in use at a time, leaving a spare for instant use while the first is being refitted.

Radio Test Light Saves Tubes

A useful radio test light can be made from the base of a burned-out tube and a double-contact auto-lamp socket. Remove all glass and internal wiring from the base, leaving the metal shell and the four prongs intact. Connect the two terminals on the auto-lamp socket to the filament-prongs on the tube base by means of lengths of small flexible wire, soldered in place. Place the socket in the position shown, and run melted sealing wax around it, holding it firmly until the wax has set; place a 6-volt, 2-cp. auto lamp in the socket and the test lamp is complete. To test the circuit, place the lamp in the tube sockets in the regular manner and note the result. If the circuit is correct, the lamp will light.



If the B-battery voltage has accidentally become impressed on the filament lines, the lamp will be burnt out, of course, but it is better to burn out a 25-cent auto light than a $3 tube. If a voltmeter having a range greater than that voltage of the B-battery is handy, it can be connected to the socket terminals in place of the lamp and used to check the circuit in the same manner. If the meter indicates 6 volts in all the tube sockets, the circuit is correct; no reading indicates a fault in the circuit, while a reading higher than 6 volts warns the user that there is B-battery voltage on the filament line.—E. V. Wills, Springfield, Mass.

Making Crystals at Home

Good crystals can be made at home. Crystal set users are always anxious to try new crystals, and many of these now on the market are not as good as they should be. The ingredients used are powdered lead and sulphur, and when properly made will equal, in clearness and volume, many of the best commercial types. Lead shavings can be melted on an iron plate over a gas stove, but if the crystal maker is equipped with a porcelain crucible and Bunsen burner, the lead can be handled more easily. When

Methods of Melting Lead and Sulphur on Iron Plate and in Crucible for Making Synthetic Crystals

the lead is molten, sprinkle powdered sulphur over it and stir with an iron wire. The lead, if hot enough, will then burn with a blue flame, and the result is a synthetic form of lead sulphide, which, when cool, will act as a good detector.

Taxi Riding a la Mode

When Frank Pagan, an eastern radio-fan taxi driver, found that he must leave his beloved radio set when he left home in the morning, and, on the other hand, could not make a living sitting at home with the set, he installed it in his cab, and found that it increased his business enormously. The loop aerial he mounted on the roof of the cab, and while he kept a set of ear phones for himself, he fitted a loud speaker in the front of the rear compartment for his patrons, who seem to appreciate the innovation, judging from his popularity.

This Enterprising Taxi Driver Fitted a Radio Set in His Cab for the Benefit of His Patrons

Panel Light Adds to Beauty of Radio Set

When the Popular Mechanics superheterodyne was designed, a light was installed on the panel to warn the operator against going away and leaving the tubes burning. There was no light on the market for the purpose, and an ordinary six-volt automobile light was used, with the globe dyed red. A manufacturer has now produced a special radio-panel light, much smaller and neater in appearance, and with a nickelplated shield of the auto dash-lamp type to keep the light out of the operator's eyes. The light can be placed between the variable condenser dials and be used to illuminate them, as well as for the warning purpose.

¶The word "kilocycle" is replacing the term "wave length" as a means of designating operating conditions of a station.

Erecting the Camp Aerial; Insert, Above, Reducing Filament Temperature; Insert, Right, Right and Wrong Way of Attaching Grounds

Getting the Most Out of the Radio Set in the Summer Season

By F. L. BRITTIN

ONE often hears the remark, "summertime is not radio time." This, while true of a year or two ago, is no longer the fact. Better instrument design, better knowledge on the part of the public and the new high-powered stations, have all tended to improve summertime radio reception.

A few simple suggestions that will help the beginner, remind the more experienced radio broadcast listener and will materially help to eliminate the prevalent idea that summertime static makes radio undesirable in the warmer months, are contained in this article.

First, put the receiver in the best of condition. This is necessary whether it is to be used at home, at the seashore, in the mountains or on tour. See that all connections are tight; look for unsoldered joints; clean the moving parts. Note that the condenser plates are free from dust, and that the tubes all make good contact in their respective sockets. Replace old batteries with new, and if there is reason to believe that any of the tubes are defective, have them tested. If found to be of low efficiency, get new ones.

If the set is to be taken on tour, make preparation to have everything on hand. If the receiver must be used with an aerial, use flexible stranded wire that can be rolled up on a spool. Any electrical dealer can supply large wooden spools used for this purpose. Take along a ground rod; an ordinary solid-brass curtain rod is useful for this purpose, and a 3 or 4-ft. length will suffice. Point one end and drill a hole through the other end with a No. 27 drill. Thread this to take a 6-32 brass machine screw, and mount a binding post on the rod to take the ground wire. When near a stream or other body of water, the ground can be obtained by submerging the ground wire, by means of a rock, or heavy piece of metal attached to the end of the wire. If dry sandy soil

is encountered, there is some difficulty in getting a good ground by the usual methods. In a case of this kind, the equivalent of a good ground connection can be had by laying a length of wire on the ground directly under the aerial. This wire should be about the same length as the aerial, and forms what is known as a counterpoise ground. To erect the aerial, a rock tied to the end of a heavy cord or length of clothesline and thrown over the limb of a near-by tree, will provide a means to elevate the aerial wire. Erect the aerial as high as possible under ordinary conditions. If thunderstorms are prevalent in the locality, it is better to erect a lower aerial from tree to tree about 10 or 15 ft. above the ground.

This type of aerial can be from 100 to 150 ft. long, and is not so readily influenced by atmospheric conditions. Take several extra insulators along for an emergency, if guying should be necessary to keep the lead wire and the aerial from coming in contact with branches.

Regardless of the type of receiver used, reception is improved under unfavorable atmospheric conditions by reducing the filament temperature. This means turning back the rheostats to the lowest possible point for clear reception. Loosen the coupling for best results from the

Above, Left, Keep Set Away from Open Windows; Right, Test Batteries Often; Below, Going Over All the Joints in the Set to See That They Are Properly Soldered

near-by stations. For more distant stations, under good weather conditions, turn up the tube filaments to the normal point. A long, low aerial, or the loop type of receiver will give the best results during the static season, whether in the home or on tour. Receiving apparatus must be protected from dampness. In the home the set must not be located near a window where rain would come in if inadvertently left open, as moisture and dampness often ruin good apparatus. This is especially true in the warmer climates. Apparatus is now so constructed that a moderate amount of dampness will not affect the instrument. On tour, a weatherproof cover for the cabinet is a good accessory. This cover can be made of waterproof material of any kind, and also protects the set in transportation. Keep the batteries out of the sunshine. If the set is to be left at home during the vacation period, disconnect the A and B-batteries. Never leave the storage battery in a run-down condition, but see that it is fully charged. Good batteries always produce the best results; a defective A or B-battery will often cause horn noises that are mistaken for static.

All Aerial Joints Must Be Soldered, and the Wire Cleaned of Corrosion and Dirt

Summertime is the best time to improve the set. Study the various circuits available, and choose the one best suited to financial and operating conditions. Long summer evenings can be utilized in rebuilding the set. If the circuit contains intruments of an obsolete type, change to the more improved apparatus. Better condensers, coils, tube sockets and rheostats have been developed during the last few months and they will add much to the efficiency of the set. B-battery eliminators have been developed until they are entirely satisfactory, and can be used to replace B-batteries in any set.

During summer, defects in the aerial can be remedied much easier than when working with numbed fingers in wintry blasts. The lead-in wire may be found to be touching the building at some point, and this often produces noises attributed to static. The aerial supports may need renewing or repair. The aerial wire may be badly corroded, and if so, put up a new one. See that the wires do not come in contact with any part of the roof, when swayed by the wind. If several new aerials have been erected on the roof, change your own so that it does not parallel them. If the wire must cross over another aerial, either raise or lower the supports so that there will be several feet of clearance between the wires. Solder all joints. If an insulated lead-in strip is used under the window sash to bring the aerial in to the set, constant exposure to the weather will render such a strip valueless and cause noises in the set, if not actually preventing reception. Pull the strip out from under the window and bring in the lead-in through a regulation lead-in insulator. If a lightning arrester has not been used, install one at once. These arresters protect the set from accumulated static potentials that often ruin the tubes during the stormy season.

Poor grounds make both summertime and wintertime radio reception bad. The writer is often requested to look over a set that should function nicely, according to the manufacturer's claims, but in-

stead produces a weak and stuttering signal. Nine times out of ten investigation shows that the ground wire has been loosely wrapped around a steam-radiator vent-cock, valve, or pipe. With such a ground no set will produce good results. If the set is designed to require a ground, a good ground is needed, and halfway measures will not do. Obtain a ground clamp from the radio dealer, and if a radiator pipe must be used, file away the paint from the supply pipe, and attach the ground clamp firmly, then solder the ground lead to this clamp. A cold-water pipe will give the best ground.

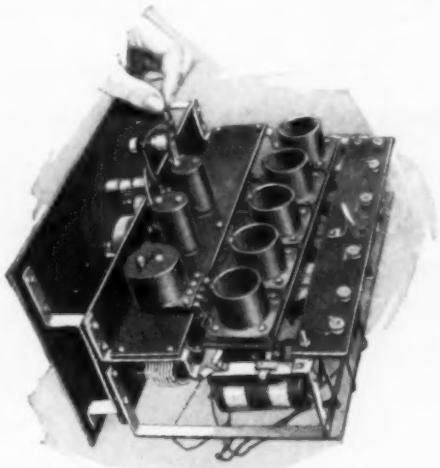
The set of today, properly installed, should give good clear summertime reception on the local stations, practically free from static. It is to be expected that static will be amplified on the more distant stations at this time of the year. The cause of static still mystifies radio engineers. If they knew just what the cause is, their task would be easy. When the signal from the distant station reaches the static level, or in other words, the static interference attains the same volume as the signal, the receiver is handicapped, and the reception poor.

Simple Ball Battery Tester Eliminates Scale Reading

A handy battery tester equipped with three colored-ball floats, has just made its appearance on the market. It is claimed that the colored balls are better than glass floats, as they do not stick to the side of the glass; they are much easier to read than the small scales used on the common hydrometer, and the new instrument takes up very little space. When testing the battery, the tip is inserted into the electrolyte, and the bulb is pressed, then released to draw the liquid up into the glass tube. Shake lightly and note the position of the balls. If all three balls float, the cell is fully charged. If one (the white) ball sinks and the other two float, the cell is still well charged. If two (the white and green) balls sink, and the red ball floats, the cell is half charged. If all three balls sink, the cell is discharged.

Shelf-Mounted Reflex Receiver Takes Up Little Space

Compactness features a five-tube reflex receiver recently built by a radio expert, in which the instruments are mounted on



Shelf Mounting Solves Space Problem and Permits Use of Short Leads

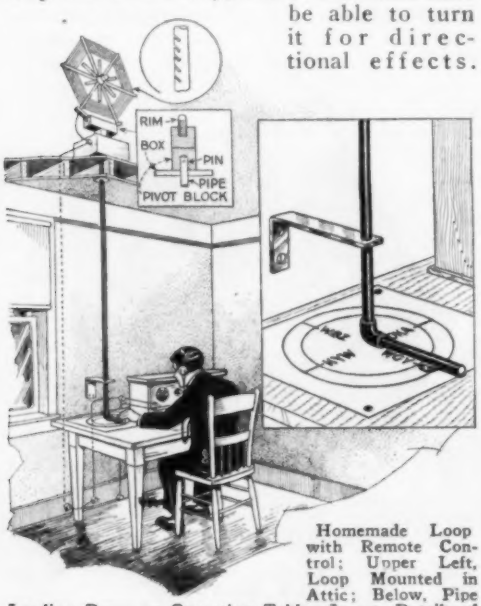
shelves. The double-panel arrangement serves to space and shield the various units. The supporting-bracket assembly is clearly shown in the illustration. The shelf at the rear forms the terminal strip; the center shelf supports the tube sockets, and it should be noted that this shelf is not mounted directly on the brackets, but is suspended on rubber strips. This method of tube mounting eliminates microphonic noises and is very desirable, especially if UV-199 or C-299 tubes are used. The upper shelf affords space for the transformers, making a very compact and efficient grouping, that will permit short leads to the various instruments.

Finishing Radio Cabinets

Many amateurs prefer to build and finish their own radio cabinets. This is a simple operation and good work can be done if a little care is taken. When applying the varnish be sure you have a clean brush. This is important, otherwise when dry the cabinet will be found to be covered with what appears to be fine particles of dust. Many blame the room conditions for this troublesome deposit, but the fault usually lies in the brush. Beat it on the palm to remove loose bristles, then soak in gasoline.

Homemade Directional Loop Has Remote Control

It is often of advantage to have the loop out of the way, and at the same time be able to turn it for directional effects.

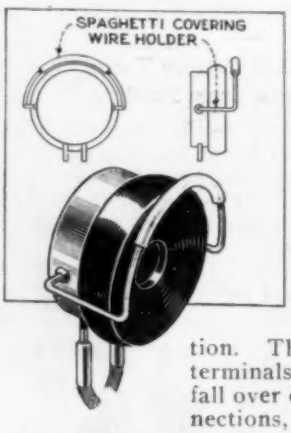


Homemade Loop with Remote Control; Upper Left, Loop Mounted in Attic; Below, Pipe Leading Down to Operating Table; Insert, Details of Arm and Chart

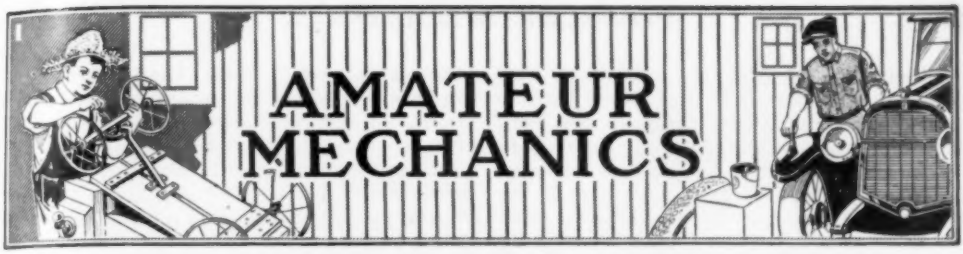
Space is usually at a premium in the average home, and unless the loop is constructed in harmony with the set and furnishings, it is better to have it out of sight. The loop shown in the drawing is of the spider-coil type, and can be wound on a simple wooden form. In this case a wheel from a discarded light buggy was used. The greater part of the rim was removed, and all but six spokes sawed off near the hub. The illustration clearly shows the method used in winding the loop. The spokes were slotted with a hacksaw, and 12 turns of stranded loop wire wound on the form. The exact number of turns to use on the loop will be found by experiment, and will depend on the type of set used. The loop can be designed for tapped leads if desired. The section of the wheel that retains a portion of the rim is fitted into a grooved block and nailed firmly in place. The block is then nailed to a pivot block that is mounted on the end of a length of pipe; the pipe and block are drilled to take a large nail, which forms a locking pin. This pipe extends down through the small wood box that acts as a bearing, as shown in the upper left-hand corner of the illustration. The pipe extends down through the ceiling to a point about 2 in. above the top of the operating table, and can be coated with aluminum radiator paint for the sake of appearance. A strap-iron arm is shown in the insert; this is screwed to the wall and the pipe run through the end. This arm prevents side-play, and the hole is sufficiently large to allow the pipe to turn freely. An elbow is used on the end of the pipe and a short length of broomstick serves as a handle. A cardboard chart will be noted under this arm. This chart can be calibrated for direction, by turning the loop to the best position for maximum reception, and the position of the handle on the chart marked with the call letters of the station. The loop terminals can be brought down through the pipe, or between the walls, to suit the builder.—C. M. Wilcox, Torrington, Conn.

Handy Phone Holder

A neat and efficient phone holder can be made with a short length of round bus-bar wire. Number 12 wire is best for this purpose, and a wire 6½ in. long should be about right for the average phone unit. Before bending the wire a 2-in. length of spaghetti should be run on the wire as shown in the illustration. This protects the terminals should the loop fall over on the cord connections, and also forms a cushion or protection between the ear and the head. The ends of the wire are then turned to fit in the holes in the shell of the receiver, and snapped in place. This handy arrangement will appeal to all who frequently use a testing phone, because it eliminates the awkward adjusting of the head band.



¶A SELECTIVE 4-TUBE PORTABLE REFLEX SET with a loud-speaker range of 500 miles and a phone range of 1,500 miles, extremely selective, was completely described in the Dec., 1924, issue of Popular Mechanics. This issue may be obtained from the circulation department.



Your Car—Repair It As You Go

By WILLIAM ULLMAN

"SOMETHING wrong with the car? Well then, why not use the car and get rid of the trouble?"

It is the voice of modern car ownership speaking. It is the last word of the first real helpful hint that has reached the troubled motorist. Any owner can take his car to the repair shop when he has trouble, but repairing as you go is indeed something new and hopeful. Ever since the first gallon of gasoline was converted into locomotion, motordom has assumed that using a car is the equivalent of bringing it that much nearer the repair shop. Now the motorist is being urged to keep his car in trim by the very simple process of using it.

One service manager recommends continued use of the car as the most successful method yet devised for getting rid of squeaks. He says that in his experience with hundreds of squeaking cars and worried owners, more damage has been done in trying to locate the exact causes

Left, Advance the Third Brush on the Generator to Increase the Charging Rate; Right, a "Shot" of Kerosene after a Trip Cleans Out the Carbon

of the noise than would ever have been caused by the noisy parts themselves. In order to start one of the spring-control

devices working properly it is often recommended that the owner drive his car fast over the roughest road he can find. No other method of working in the particular device has been found to be quite so satisfactory. These are extreme instances. Without going quite so far with the idea, there are many adjustments and improvements that can be made to a car while it is in use.

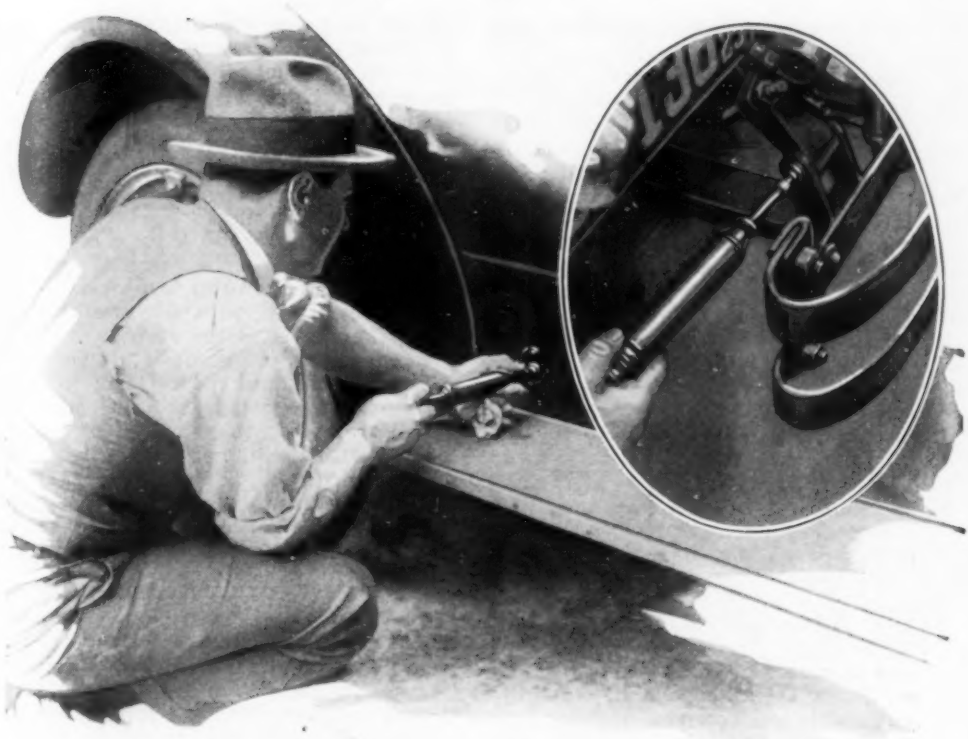
One of the most important of these repair-as-you-go plans is the process of getting rid of carbon day by day. An interesting feature of the new repair plan is that even if the owner has been making the mistake of driving around with an excessively rich mixture, or has been choking his motor in starting because of mis-

Above, Filling the Battery; Below, Turning the Motor Over with the Crank before Starting

taking a very lean mixture for economy, he can start at any time to remove carbon as he goes. The recommendations of one manufacturer illustrate this point. After a long run, he advises, pour about a tablespoonful of kerosene into each cylinder through the petcock, turning over the engine a few times with the starter or crank so that the kerosene will have an opportunity to get under the valve heads and loosen the carbon particles around the valve seats. Here, then, is the first installment on a repair job that can be done while the car owner goes merrily on his way.

The sooner one starts with the repair-as-you-go habit, the more effective the plan, but even inevitable repairs can be postponed without possible further damage to the car, if the owner is willing to cast aside a lot of worn-out ideas. With respect to carbon removal, in event of a late start with the plan, it is best to increase the quantity of kerosene used to loosen the carbon particles and to repeat the process every evening for a few days. The theory of the kerosene process is that, when the engine is started in the morning, the loosened carbon particles will be blown out through the exhaust, but if the engine is already choked up with carbon, it is best to inject the kerosene while the engine is moderately warm and then run the engine again about an hour or two later. The faster the engine is run, the better the cylinders will be cleaned out, but the car owner is not justified in racing a cold engine if he waits until morning.

Recharging the battery on the day's trip probably hasn't occurred to more than one car owner out of a thousand, but it is a simple and practical way of avoiding the trouble of seeking a battery station and having a "rental" installed. If the battery is weak at the start, the car owner is urged to add plenty of distilled water while the engine is running and then to advance the third brush on the generator so that there will be a maximum output from



Proper Attention to Chassis Lubrication Is a Vital Feature of Repairing as You Go

the current source for use in recharging the cells. Five or six hours of steady running with the generator delivering fifteen or more amperes will bring the battery up to a point where it will handle the next morning's cranking process satisfactorily. A few days of this treatment, and it will be back to normal, provided the battery has not been allowed to fall to a point where its discharge is excessive and a further injury to itself. One of the tricks of repairing en route is to avoid letting troubles get too deep-rooted before applying the remedies.

Even if the motorist does not know how to advance the third brush on the generator, he can at least give the battery every advantage of the current being generated by avoiding the mistake of robbing the battery of the current it needs. This means watching the ammeter on the instrument board. If the car is driven too fast, the charging rate will very likely fall to a point where the battery is hardly being charged at all. Likewise, if the engine idles, as in traffic or when coasting, the ammeter will register discharge and the battery will not be getting the full advantage of the plan. Usually there is a point at which the charging rate is greatest. The idea is to drive at a speed that will keep the ammeter needle where it indicates that this point is being maintained. When night comes on, current can be saved by switching off the instrument-board light, or any other decorative lights, and by using the brakes as little as possible. The stop light will use up current if the driver waits in traffic with his foot poised on the service-brake pedal. The emergency brake should be used when the car has to be held stationary. Another point is: Don't let the terminals of the battery become coated with verdigris. Clean them off occasionally with a wire scratch brush and coat them with vaseline. This allows the "juice" to go freely where it is needed, instead of expending a part of its energy in forcing its way through a heavy coating of corrosion. Often when the battery is thought to be run down there is nothing the matter but corroded terminals or ground connections.

The fact that the repairman often finds it necessary to take a run around the block with the machine in order to apply the right remedy to some ailment has been taken as a tip by a few car owners. This has led to the idea of combining

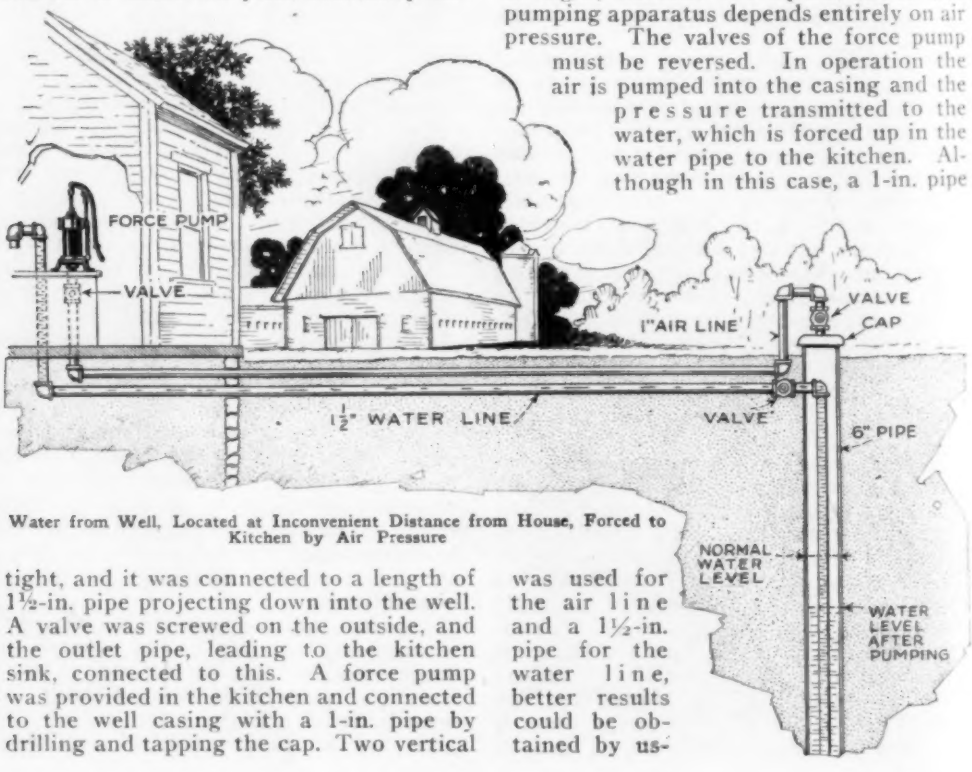
trouble riding with car use, and it is now being encouraged by manufacturers who are naturally eager to see their cars spending fewer days in the repair shops. It has been demonstrated time and time again that the only satisfactory way to adjust a carburetor is to try different settings of the jets while actually operating the car. Now, it appears, this idea is being expanded to cover the whole range of adjustments and minor repairs, and also to cover the important feature of prevention of major repairs.

Few car owners appreciate the number of troubles that can be overcome through the use of different grades of oil, or through the quantity of lubricant used. Worn universal joints are made to give many more miles of service simply through keeping them lubricated with an excess of fresh and heavier grease. In the engine itself many possibilities are offered in the lubricating line. Use of heavier oil prevents pumping of lubricant past the rings. Owners frequently try such methods but give them up when some unexpected by-product in the way of trouble develops. They may find, for instance, that the heavier oil encourages overheating at high speed, or that the oil, when cold, places too great a burden upon the battery and starter motor. The answer to this is to add a little engine oil to the gasoline when a long and fast ride is contemplated, and to turn over the engine a few times with the crank before using the starter in the morning.

Repairing as you go demands a willingness to understand the car and to make certain compensations in order that the simple remedies may be effective, but what motorist wouldn't prefer this to the adjustments he is required to make in his daily transportation facilities when the repairman announces that the car will have to remain in the shop for a few days?

A Novel Water Pump

The 6-in. casing of a well was drilled and tapped for a 1½-in. pipe 2 ft. from the top. A nipple was screwed in, using iron cement to make the joint absolutely air-tight, and it was connected to a length of 1½-in. pipe projecting down into the well. A valve was screwed on the outside, and the outlet pipe, leading to the kitchen sink, connected to this. A force pump was provided in the kitchen and connected to the well casing with a 1-in. pipe by drilling and tapping the cap. Two vertical valves should be placed in this air line, both opening toward the well instead of away from it, but the valve in the water line should open away from the well. It is very important that all joints be made air-tight, because the operation of this pumping apparatus depends entirely on air pressure. The valves of the force pump must be reversed. In operation the air is pumped into the casing and the pressure transmitted to the water, which is forced up in the water pipe to the kitchen. Although in this case, a 1-in. pipe was used for the air line and a 1½-in. pipe for the water line, better results could be obtained by us-



Water from Well, Located at Inconvenient Distance from House, Forced to Kitchen by Air Pressure

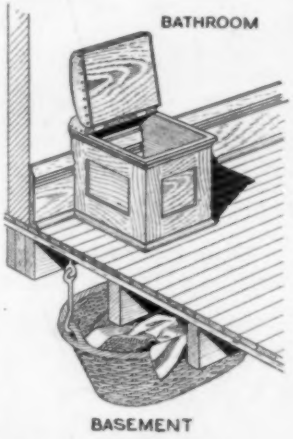
ing the 1½-in. pipe for the air line and the 1-in. pipe for the water line. The whole well casing becomes a pressure tank, and by pumping enough air into it, water can readily be obtained at the kitchen sink, so that it will blow out as soon as the faucet is opened (which should be provided at the end of the water line, although this is not shown in the drawing). It is, of course, preferable to use a small power condenser in the kitchen instead of a force pump, and in this case a pressure gauge is necessary as a safety measure. Where a hand pump is used no pressure gauge is needed.

Cocklebur Guards

Last fall I bought a six-acre patch of corn that was infested with cockleburs, and as I did not wish them to get into my horses' tails, I provided sleeves for the tails as follows: I took an old inner tube, cut two 30-in. lengths from it and made several holes in each end. After braiding and looping the tails, I slipped a sleeve over each and tied it in place by strings run through the holes in the ends of the sleeve. The burs will not cling to the rubber.—Willis Mehanna, Bussey, Iowa.

An Easily Made Clothes Chute

In many homes not equipped with a built-in clothes chute, one can easily be provided at small cost. It consists simply of a small box with a hinged lid built in a corner or other convenient place in the bathroom, which is usually the handiest place for such a chute. A square hole is cut in the floor below the box and a clothes basket hung on the joists underneath to catch the clothes. This is better than a box or basket on the basement floor as it takes less space. The hole in the floor should be cut between two joists. The top of the box may be padded and covered with leather to serve as a seat. Of course, this installation applies only to the first floor.



Supporting Baby's Bathtub

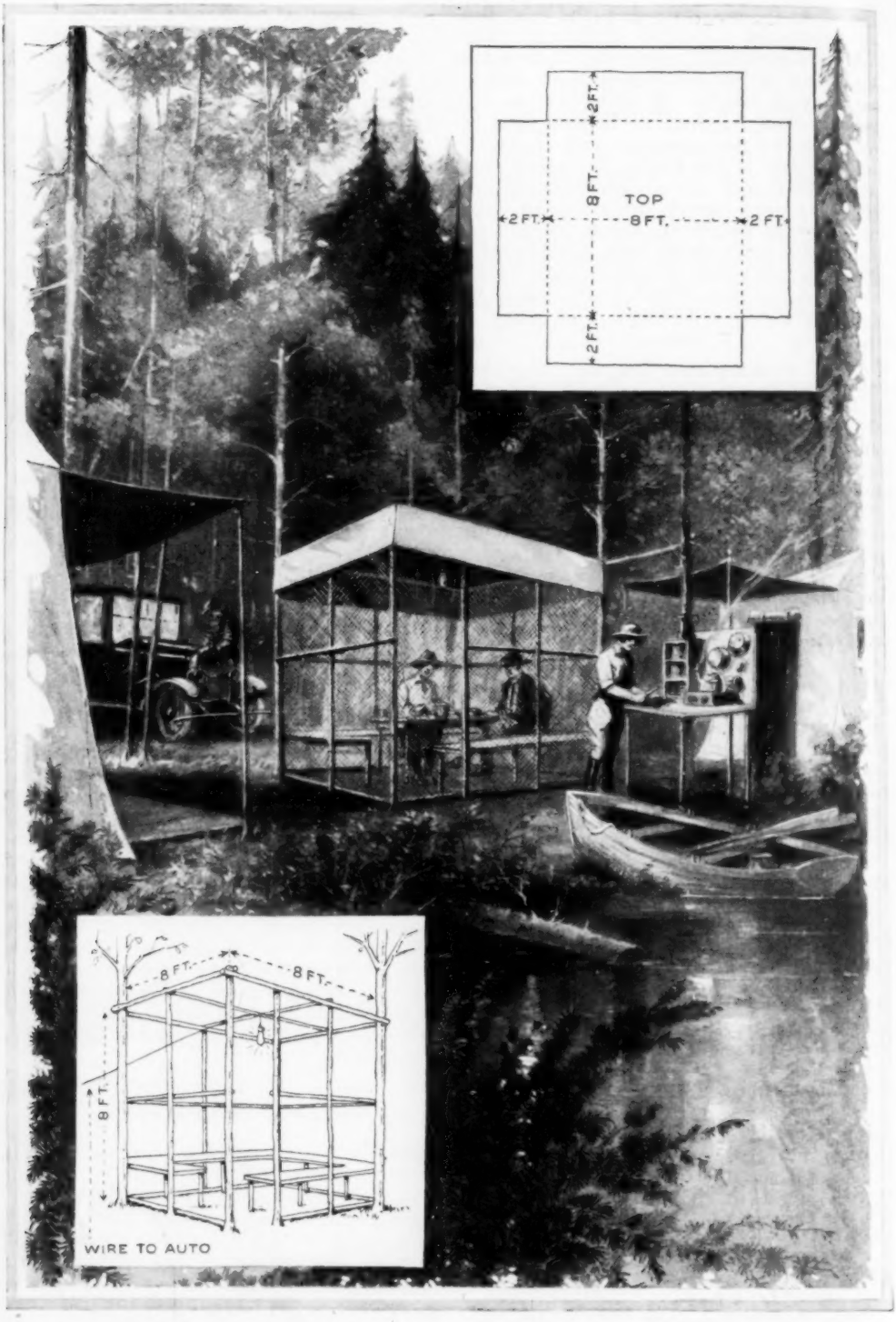
In a small house or apartment, it is often difficult to find a place for dressing, undressing and bathing a baby without

Board on Bathtub Supporting Baby's Tub Facilitates Bathing

cluttering up the bathroom and causing inconvenience to adult members of the family. We overcame the difficulty by making a board fit over the bathtub. It was made of three-ply pine and extended about an inch from the bathtub on either side, narrow cleats being nailed to the underside to prevent slipping. The board was just long enough to hold the baby's tub with enough space to spare to lay the baby on when dressing it. When through, the board can be slipped out of the way, and the little tub hung up or placed in a closet. It is practical to cover the board with white oilcloth so that it can be easily cleaned and dried.—Mrs. Eleanor O. Miller, Madison, Wis.

Retaining Split Hub Cap

If a Ford front-hub cap becomes split, or the threads stripped, it can be kept in place by means of a hose clamp applied over the cap. The clamps used on the side water hoses of the motor are the right size for this purpose. This method is intended only for emergency use, as the hub caps are quite cheap and the rear caps can be used for the front wheels if necessary.—E. T. Gunderson, Humboldt, Iowa.



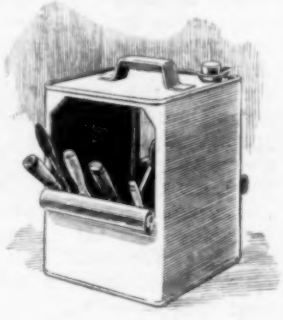
Flies, Mosquitoes and Other Insects, Which Make Camping Unsanitary and Uncomfortable, Can Be Eliminated by a Simple Rustic Inclosure, Screened with Netting; a Canvas Top Sheds Rain and Provides Shade

A Screened Camp Shelter

When out camping in the woods near a stream, flies, mosquitoes and other insects are a constant source of annoyance and tend to make living conditions rather unsanitary. However, a screened inclosure of the kind shown in the illustration will eliminate this trouble and make the camping trip much more enjoyable. The frame is made of straight tree branches, stripped of twigs and leaves. Convenient dimensions are 8 ft. high, 8 ft. wide and 8 ft. long. The shelter can, of course, be made larger or smaller as desired. The posts should be set into the ground for a foot or two, to make the structure stable; in some cases, as the one illustrated, two small trees can be used as corner posts. A bench is provided on the inside, and the sides are then covered with mosquito netting, or with ordinary screen, depending on how long one is to stay in the camp. A large piece of heavy canvas is used for a roof. It is cut to the dimensions shown in the upper detail. The top should be slightly inclined to shed water readily. If the trip is made by automobile, an electric light can be provided by running a length of lampcord to the storage battery, a socket and lamp being fastened at the top of the inclosure. A door may be hinged on one side or the mosquito netting simply hung over the opening.—G. Kratzner, Chicago, Ill.

Handy Garage Tool Carrier

A convenient tool carrier for the garage or home workshop can be made from an old oilcan, as shown in the accompanying illustration. Two sides of the can are cut open as indicated, leaving the upper corners intact. The free portion of each side is removed except for an inch or two, this part being bent or rolled over, as shown, so that there will be no sharp edge at the bottom of the opening. The other edges are smoothed with a file. Small tools and accessories placed in a carrier of this kind can be easily taken from place to place.—G. E. Hendrickson, Argyle, Wis.



Extension Shelf on Phonograph

Many phonograph records are broken by leaving them on chairs or on the floor. If it is inconvenient to have a small table

Handy Sliding Shelf in Phonograph Prevents Breaking Records

near the instrument on which to lay the records when sorting them, a sliding shelf, as shown in the illustration, will be found useful. It is made of a piece of heavy wallboard or light wood, cut to fit the width and length of the top record shelf. Along the back edge is nailed a piece of wood of such height that when the shelf is pulled out the strip will bear against the top of the cabinet, keeping the shelf secure and practically horizontal. Laid on this shelf, the records are in little danger of falling or being knocked off.—E. W. Cornell, Adrian, Mich.

Mower Guard Stretcher Grips

Quite often the grips that hold the wire on a pair of wire stretchers become so worn that they will no longer hold the wire while it is being stretched. One of the best methods of repairing the stretchers is to replace the grips with a pair of old mower guards. These have just the right kind of "hook" in them to catch the wire properly. There is no slipping and no time lost in trying to adjust a grip that won't hold the wire.—Rufus E. Deering, Clements, Kans.

Combined Kennel and Wood Box

In most farm houses a wood box is kept on the kitchen porch. Its advantages may be increased by making the lower part

Combined Dog Kennel and Wood Box in Farm House Saves Space

serve as a dog kennel. The bottom is raised about 18 in. and a door cut in the side, as shown in the drawing. This arrangement is neat and also effects a saving of space, which is usually rather limited in the working quarters of a farm house.—E. A. Goering, Langenburg, Sask.

Keeping the Old Clock Running

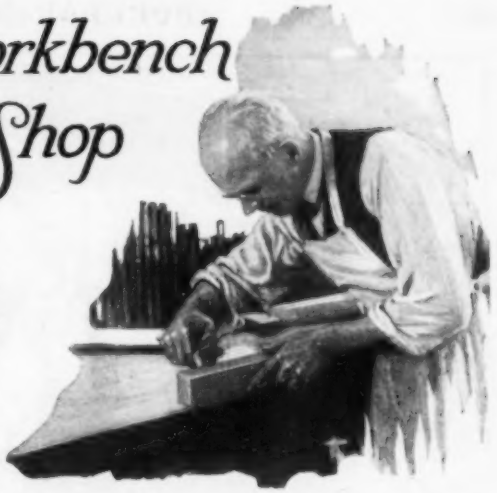
Though an old clock may stop for no apparent reason, you may be sure that there is good cause. Its works may be in need of a thorough cleaning. The pallets on the anchor of the escapement may not be meeting the teeth of the pinion properly; or, the bearings of the pinions in general throughout the clock may be so worn that the teeth of the gears no longer mesh as they should. Cleaning the works of a clock with gasoline and reoiling the bearings is a simple operation that anyone can do. Adjusting the anchor of the escapement so that the pallets will meet the teeth of the pinion properly is likewise a simple operation. But, taking up the bearings is not quite so easy. Still, if one goes about the job in the right way, it is a simple matter and many years of service can be added to the life of the old clock. The works should be removed from the case so that one can get at both sides of the frame, and then, working with a thin punch that has a rather sharp point, a series of punch marks are made in a circle about each of the loose bearings. The punch should be tapped lightly in making these marks so that the hole will not be closed up too tightly the first time around, for it is better to work the metal in gradually toward the center, so that when all the excess play is taken up, the pinion will bear evenly all around and run true. Slight wear on the faces of the pallets sometimes causes trouble. If the slightest wear is apparent rub these surfaces down on a fine oilstone.

Attaching Screen-Door Spring

With the customary coil-spring arrangement on screen doors, trouble is often experienced because the door is often thrown wide open, and the spring eventually becomes stretched so that it will no longer keep the door tightly shut. This trouble can readily be overcome by arranging the spring in the manner shown, a length of strong cord being tied to one end of the spring, slipped through a pulley fastened above the door, on the inside, and run to the door as indicated. No matter how far the screen door is swung open, the spring will close it. Of course, the spring will not last "for ever," but it will last much longer if mounted in this way.—C. L. Epton, Spartanburg, S. C.

¶To hold back shadows when printing from a negative, dip a piece of putty into dry Indian red or yellow ocher and apply to the clear glass of the printing frame over the shadow that is to be held back. The color can be applied as lightly and evenly as desired.

Making a Workbench for the Home Shop



A BENCH for the woodworker should combine three qualities—true working surface, rigidity and efficient clamping devices. According to purpose, designs may vary widely as in the two described, if the above essentials are embodied in them.

The simple manual-training bench illustrated in Figs. 1 to 13 is built of hard maple, with the upper rails joined to the top by means of lag screws and the stretchers to the legs with drawbolts, facilitating "knocking down" for crating. Stock sizes of material are used, ¼ in. reduction in thickness and width being figured for waste in the mill dressing, so that a 2 by 4-in. piece is dimensioned as 1¾ by 3¾-in. in the drawings; but if stock material comes thicker or thinner it need not be sized to the exact dimensions given, as other dimensions may be slightly altered to fit.

For the top, glue up, edge to edge, three pieces of 2 by 4-in. stock, 3½ ft. long, and one piece of 2 by 3-inch. The joined edges must be jointed straight, and, if machine jointed, should be smoothed by hand, as well, to remove the ribs. Fit two pieces together, one with the heart side, and the other with the sap side, up, as shown in the top section illustrated for the second bench, Fig. 14, to prevent warping. They should meet at the ends and part very slightly at the center, so that when clamped up the edges will come tightly together, forming snug joints, and the ends, being brought slightly under compression, will be less likely to open up under shrinkage. Since maple is very close-grained, glue can be absorbed only to a limited extent, so if possible the surfaces of the joint should be scratched with a scratch plane; in the absence of this tool, use a toothed scraper. Warm the wood and have the glue well cooked, to the consistency of cream. The use of ½-in. dowels will increase the strength of this joint.

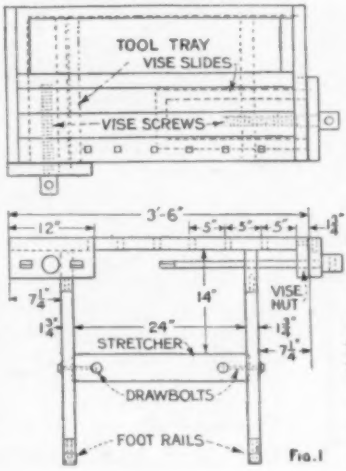


Fig. 1

The front piece, acting as the front band, is illustrated as having a tenon worked on each end 1¾ in. long, 2 in. wide, and ¾ in. thick, which is similar to that detailed for the front band of the second bench (Fig. 16). A saw kerf is made ¼ in. from the shouldered edge, into which an expanding wedge is driven when the band is assembled with the end bands, thus forming a dovetail. If preferred, this tenon may be left off, and a mortise cut in its place, into which a slip-tenon can be glued. By this means the ends of the top are left free to plane, making easy the correction of irregularities from sawing. The truing up of the top is a matter of considerable labor. If there is much irregularity, reduce first with a scrub plane by planing diagonally from corner to corner, afterwards using a jointer. Finish with the grain. To be sure that the top is not in wind (twisted), lay on edge at each end a narrow straightedge and sight over the tops. Lower the high corners and bring smooth to a straightedge in all directions. Scrape off all plane marks. Make the top as thick as the stock will allow, since it is a waste of time and energy to

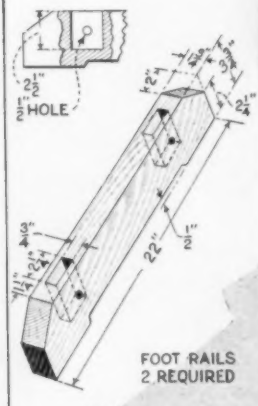


Fig. 2

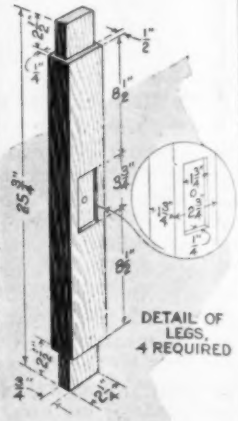
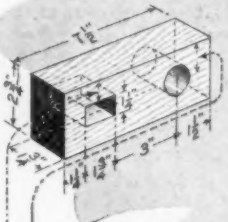
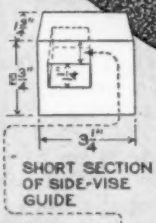


Fig. 3





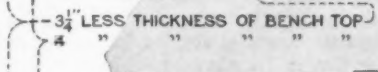


Fig. 4

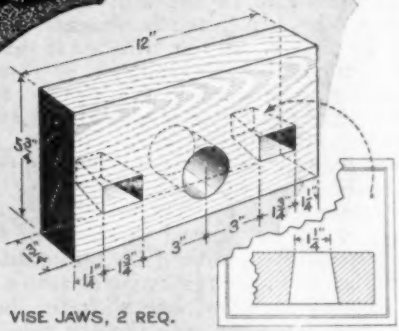


Fig. 5

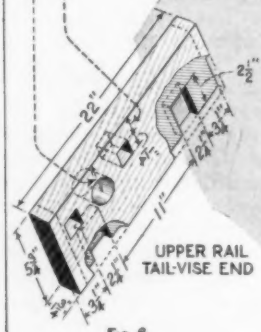


Fig. 6

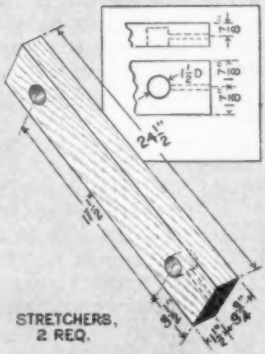


Fig. 7

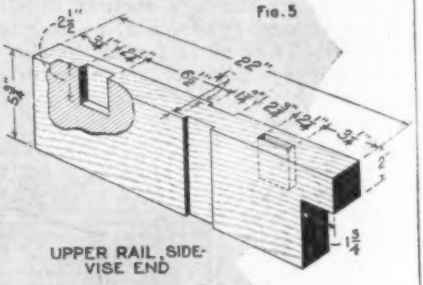


Fig. 8

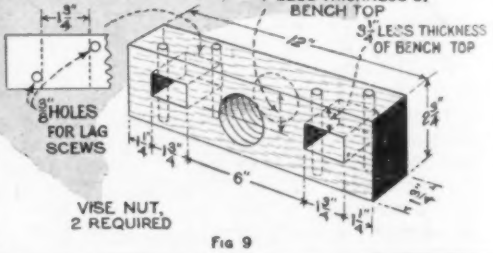
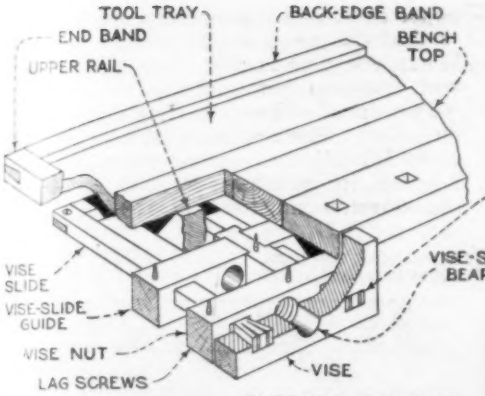


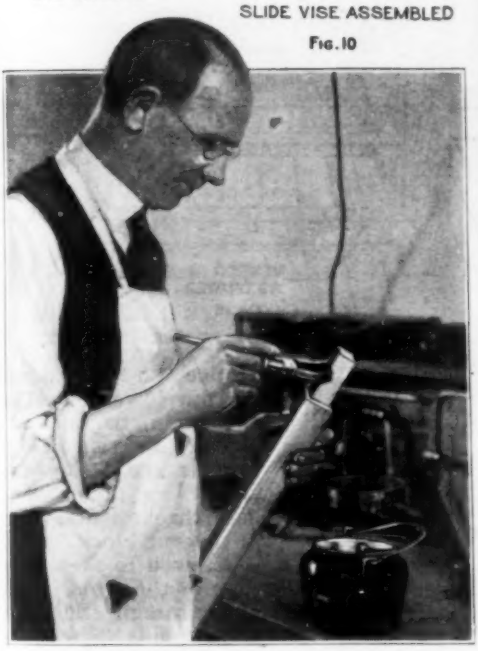
Fig. 9

Various Details of Construction for the Simple Manual-Training Bench That Will Prove Easily Built by the Home Mechanic; the Fact That the Bench Can Be Knocked Down for Crating Makes It Especially Suitable for the Flat Dweller



SLIDE VISE ASSEMBLED

Fig. 10



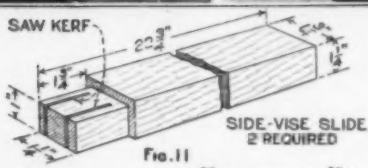
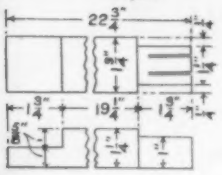
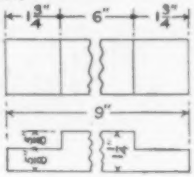


Fig. 11



TAIL-VISE SLIDE, 2 REQUIRED

Fig. 12



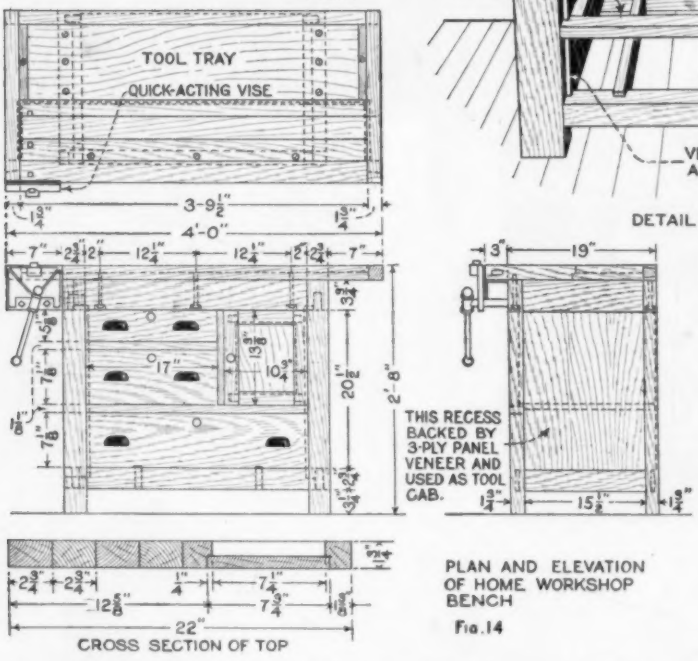
CROSS BRACE

Fig. 13

remove more wood than is absolutely necessary. Straighten and parallel the edges. Square the ends and cut a ¾ by ¾-in. groove full width in the center of each. Rabbet the underside of the rear edge ½ in. wide and ¾ in. deep to fit over the edge of the tool-tray board.

The back and end bands are of 2 by 2-in. stock squared up, a dovetail mortise being worked in the ends of the end pieces as detailed in Figs. 16 and 17. A ¾ by ¾-in. groove to mate with that in the ends of the top is plowed in each, and before assembly a slip-tongue, ¾ by 1½ in., is inserted. The back band is rabbeted ¼ in. wide to fit over the tray board. Glue the corner joints of the band but leave the slip-tongues dry. They aline the top with the bands, but allow it to shrink or swell without buckling or checking. The tray board is 1 by 8 in. by 3 ft. 2½ in. laid in the rabbeted recess and secured by three 2-in. flat-head wood screws at each leg rail. The two stretchers are 2 by 4 in. by 2 ft. ½ in., with a 1½ in. hole bored nearly through the thickness, centered 3½ in. from each end. Bore ⅜ in. holes in from the ends to meet them.

Each leg is of 2 by 3-in. stock, 2 ft. 1¾ in. long, with a tenon ¾ by 2¼ by 2½ in. centered on each end and a mortise ¼ in. deep 8½ in. from the upper shoulder, drilled, to receive a stretcher end. Both upper rails are 2 by 4 in. by 1 ft. 10 in., with mortises 3¼ in. from each end in the lower edges for the leg tenons. Fit the joints close, and apply glue to both tenon and mortise. The side-vise rail is notched around the vise nut, as detailed, while a dado ¼ in. deep is cut in each side



PLAN AND ELEVATION OF HOME WORKSHOP BENCH

Fig. 14

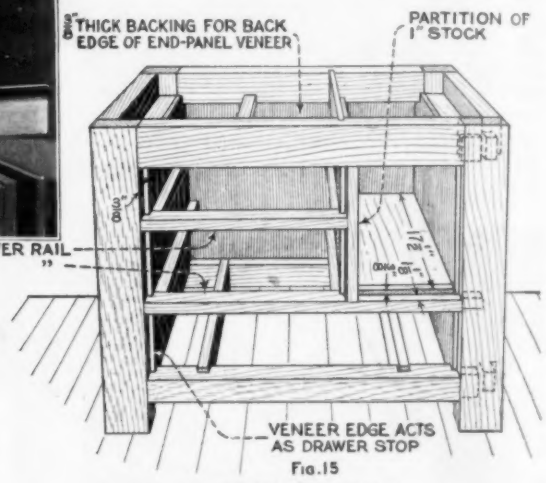

⅜" THICK BACKING FOR BACK EDGE OF END-PANEL VENEER
PARTITION OF 1" STOCK
SHORT DRAWER RAIL
LONG " "
VENEER EDGE ACTS AS DRAWER STOP

Fig. 15

DETAIL OF FRAME

upper rails, and if necessary, counterbore so that the screw heads may be sunk in. When the glue is dry, assemble the legs with the stretchers and top.

The detail shows clearly the vise construction. The two slide bars, 1¼ by 1¾ in. by 1 ft. 10¾ in., have tenons on one end 1 by 1¼ in., saw-kerfed for expansion in the dovetail mortises in the vise jaw. Notice the shoulders on the lower sides of the slide tenons, designed to resist clamping strains. On the side vise these slides pass through holes cut in the nut block, which is screwed to the under edge of the front band, and through the two-piece guide block fitting into the dados in the upper rail. In the tail vise the bar slides pass through the upper rail, eliminating the guide block, and a cross-brace is half-lapped across the ends, secured with screws only, so that the vise can be removed. A 1½-in. wooden bench screw 14 in. long, or better, a 1¼ in. steel screw, should be used in each vise. At each end of the tool tray secure a triangular block with one screw, to facilitate the sweeping out of shavings. Cut stop holes as illustrated, and make a hardwood stop 6 in. long to fit snugly.

8½ in. from the notched end, into which the two sections of the vise guide fit. The other upper rail acts as guide for the tail vise slides, so that 1¼ by 1¾-in. holes are cut as dimensioned in the detail, the distance from the upper edge being 3¼ in. less the thickness of the bench top. The screw-guide hole is just large enough to admit the screw without binding, and its center is 4 in., less the thickness of the bench top, below the upper edge.

Before assembling the legs and rails, bore ⅜-in. lag-screw holes through the

Build the top of the cabinet bench of 2 by 3-in. stock in the same manner as that of the other, but making it 4 ft. long.

Since a patent quick-acting vise is used, all wooden vise apparatus is eliminated. Cut the legs ½ in. long and lay out for the mortises from the lower ends. Select the best side and edge of each for faces and mark them, laying out on the other faces according to figures in the details. Notice that the top of the upper mortise is 1¾ in. from the upper end, allowing stock enough to prevent the upper rail tenon stripping out.

The upper rails are of 2 by 4-in. stock. The end tenons are flush with the lower edges, and 2 in. wide, those of the long front and rear rails being 2 in. long, while those of the end rails are only ½ in. The lower rails are 2 by 3 in., with full-width tenons. Cut dados ⅜ in. deep for slide cleats as shown. Assemble the end rails and legs, glue and screw cleats flush with the inside edges of the rails and inside surfaces of the legs, and cover over the inside with ⅜-in. 3-ply panel veneer, notched to fit around the rails. On the drawer end the edge of the veneer is ⅜ in. back from the front of the leg, forming drawer stops; while on the other end, that portion lining the cupboard is 1⅛ in. back from the front of the legs. The rear edges are ⅜ in. from the outer faces of the rear legs, making backing for the veneer back. Use ¾-in. flat-head screws, countersunk, for the veneer.

The drawer rails are 1⅛ in. net by 2 in. The tenons on both ends of the long rail and on the left end of the short drawer rail are 2 in. long and ¾ in. thick, centered on the width, and as wide as the thickness. That of the right end of the short rail is ¾ in. long, engaging with the partition.

Assemble the frame, and, while the glue is setting, glue up the partition and shelf from 1 by 10-in. stock. Cover the back of the frame with panel veneer, screwing stops on the rail edges where needed. From the inside of the right leg lay off a distance of 10¾ in. along the long rail and

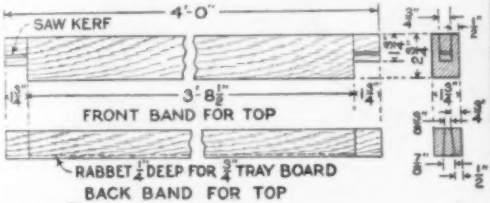


Fig. 16

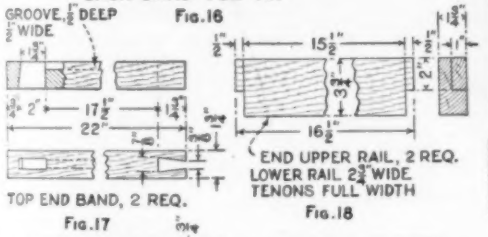


Fig. 17

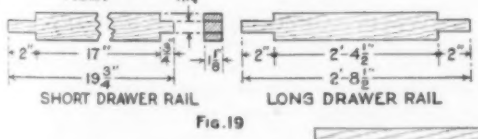


Fig. 19

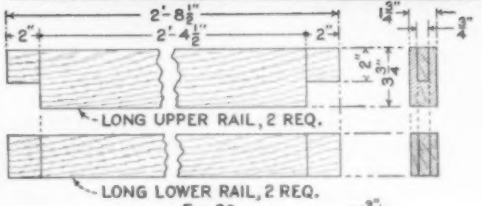
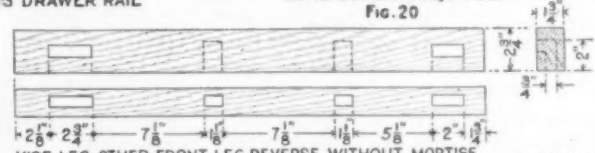


Fig. 18

Fig. 20



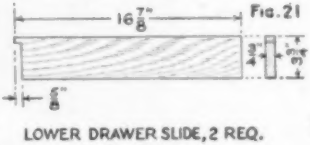


Fig. 21 Fig. 22

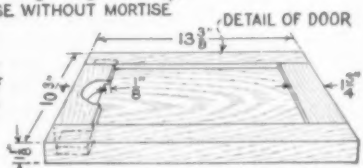
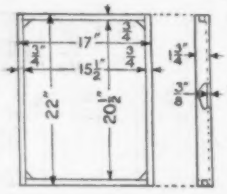
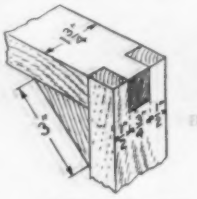


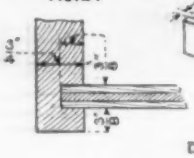
Fig. 23

glue and screw to the back a cleat ¾ in. square. Put a like cleat along the end and back to support the shelf. Cut the shelf 10¾ in. long and screw in place on the cleats. The front edge, rising ⅜ in. above the rail, forms a door stop. The partition is cut long enough to admit a cleat on the lower end under the shelf and the upper end bearing against the cleat between the two upper rails, but must not project below the drawer rail, lest it interfere with the long drawer. The short rail must be put in at the same time as the partition, its short tenon fitting in a mortise cut in the partition, the front edge of which must come flush with the front of the rails, forming a stile. Make the cleat slides for the long drawer of 1 by 4-in. maple, as shown in the detail. The projecting upper edges (rising 5/16 in. above the rail) form stops for the drawer. The slides for the small drawers are ¾ in. net by 1⅛ in., and are glued and screwed along the end between rails and back. They must be parallel to each other and square with the front. Attach the top by means of lag screws through the long upper rails. If drawer front material in maple is not obtainable from regular stocks, it is cheaper to make it by hand than to have it specially milled. Use 1 by 8-in stock for the two larger drawers, jointing the bottom and top edges straight and plowing a ⅜ by ⅜-in. groove ⅜ in. from the lower edge inside. Cut the front pieces ¼ in. longer than the opening, and rabbet the ends 15/16 in. back to a thickness of ⅜ in. Plow and size the sides, cut them ½ in. shorter than the distance from the front of the rail to the back of the cabinet, rabbet the back ends ¾ in., and assemble with the front and back, using screws. If an especially durable job is desired, dovetail the sides into the front.

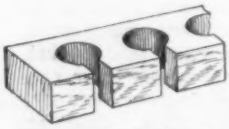




DETAIL OF DOOR FOR END CABNETS
FIG. 24



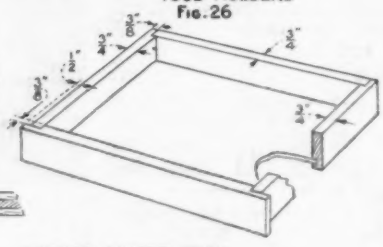
DRAWER CONSTRUCTION
FIG. 25



FOR CHISELS, FILES, ETC.

FOR BRACE, SPOKESHAVE, ETC.

TOOL HOLDERS
FIG. 26



Cut a piece of panel veneer for the bottom, making a snug fit, and slide into the groove past the back. A screw or two through it into the back will prevent it from working out. Insert the long drawer and scribe along each side of the slides with a pencil, and guiding by these lines screw strips of wood ⅜ in. thick to the bottom as guides. Replace the drawer and mark the front ends for cutting to fit. By beveling the ends and top slightly the front can be made to show very little joint. The other drawer is fitted in the same way. The upper drawer is made of 1 by 6-in. stock.

Build the cupboard door of 1¼ by 2-in. stock for stiles and rails, plowing the insides edges ⅜ by ⅜ in. to receive the panel veneer, and cutting tenons on the rails ⅜ by ⅞ by 1¼ in., as dimensioned in the detail. Do not glue the panel. When the glue is set, surface the joints and smooth up. Fit to the opening with a clearance of less than 1/16 in. all around, and hang with 2 by 2-in. fast-joint butts. The end recesses are tool cabinets. Each door is built to close against the bench end, using 1 by 2-in. stock for stiles and rails, rabbeted instead of plowed for the panel, the corners being joined as shown in the detail and re-enforced by corner blocks glued and screwed inside. Cut the panel veneer to exact size, beveling the edges slightly, so that when tapped to a seat in the rabbet the joint around will be very tight. Secure with small screws, and hang with 3 by 3-in. fast-joint butts. Mortise in the drawer locks and screw on the vise.

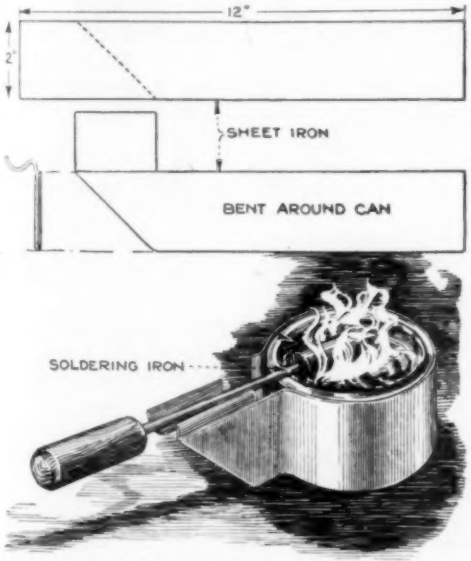
Since individual equipment varies considerably, no arrangement of tools is shown. On the whole, as shown in Fig. 26, simple clips, small screw hooks, turnbuttons and wooden racks are best for the tools.

Preventing Straw-Hat Glare

The timekeepers in a southern oil refinery have found a novel method of reducing the reflected glare from the underside of their straw-hat brims. The sun in the south is very hot, and the glare, in time, becomes very hard on the eyes. They simply sew a piece of black cloth on the underside of the brim, in front of the eyes, and this is found to eliminate the trouble almost entirely.—L. H. Unglesby, Baton Rouge, La.

Heating Small Soldering Coppers

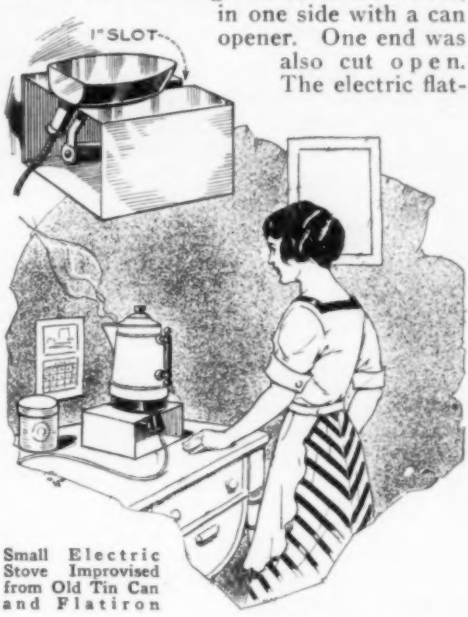
The autoist, home mechanic or radio worker has frequent need of a light soldering copper. A gasoline torch is inconvenient to use, when time is limited and only a little light work has to be done. A sheet-iron stove, made as shown in the illustration, will give good results in heating a soldering copper with either "canned heat" or sawdust, soaked in denatured alcohol, as fuel. In the latter case a seamless can with a friction top, should be used as a container for the sawdust, to prevent evaporation of the alcohol and to provide a method of readily extinguishing the flame, which can be snuffed out instantly by replacing the cover. A sheet of asbestos, or an asbestos flatiron pad, should be placed underneath the stove to prevent burning the bench top. The pattern above the drawing shows the dimensions and the points where the sheet metal is bent.



Using "Canned Heat" or Sawdust Soaked with Alcohol to Heat Small Soldering Copper

Improvised Electric Stove

When I wanted an electric stove, I took a tin can, 6 in. square and 6 in. high, and cut a slot, 6 in. long and about 1 in. wide, in one side with a can opener. One end was also cut open. The electric flatiron was slipped into the slot with the bottom up, as shown, and the stove was ready for cooking. All kinds of liquids may be kept hot on it, and it has various other uses. After the iron is thoroughly heated the current may be turned off, and it will keep things warm a long time.—Mary S. Hitchcock, Hannawa Falls, N. Y.



Small Electric Stove Improvised from Old Tin Can and Flatiron

Removing Grass along Fence

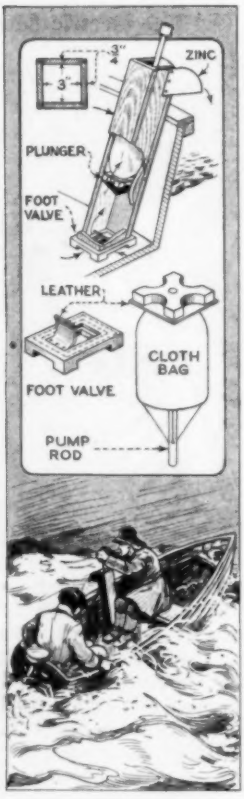
Grass along fence posts can be burned away with a common gasoline blowtorch without injury to the posts, if a wet gunny sack is taken along. The grass will burn quickly and the gunny sack is then used to quench the embers. This is an easy and simple method and eliminates the danger of burning the posts close to the ground. —Edwin Humes, Delaware, Ohio.

Cleaning Tarnished Silverware

Tarnished silverware can be cleaned by means of a solution consisting of 1 oz. of cyanide of potassium (poison) dissolved in a quart of water. The work can either be immersed in the solution or rubbed with a rag saturated with it. After cleaning, the silverware must be thoroughly washed in clean water and wiped dry.

Making a Boat-Bailing Pump

It is an easy matter to make a wooden bilge or bailing pump for skiffs; one having a square barrel, 3 in. inside, is suitable for the smaller boats, and one 4 in. square, for larger ones. The working position of the pump is shown in the drawing. Its length and the angle of the foot on which it is supported must be made to fit the boat. The body may be simply nailed together but it is better to rabbet the edges before nailing. A sheet-zinc spout is tacked on to carry the bilge water overboard. The foot is made ⅛ in. thicker than the rest, permitting it to be grooved on three sides to allow the entrance of water. A square hole is sawed out of the center to fit the barrel, and a piece of leather is tacked over this hole along one edge, as shown, to form the foot valve. The pump rod is made of a length of ⅝-in. dowel stock with a wooden knob pinned on one end to serve as a handle, and a piston at the other end. The piston consists of a piece of pine or cypress wood fitting snugly inside of the barrel, having the sides cut out to form water passages and a square piece of thin leather on the upper side to form a valve over the water passages. A cloth bag is fastened above the leather and is hung loosely with four strings tied at the upper end of the rod; the purpose of the bag is to send up the water in greater volume and prevent back pressure against the leather valve at the bottom. The top of the bag should not be permitted to lie on the plunger. A 3-in. pump, 20 in. long, will throw out about a bucket of water every four or five strokes; which is ample for ordinary use.—James F. Hobart, Dunedin, Fla.



Keeping Irrigation Canals Clean

In one irrigation district where the moss accumulates in the canals during the summer months to such an extent as to practically stop the flow, the ditches are cleaned out, without shutting off the water, by means of a disk harrow. A double-section harrow, with 20-in. blades at 7-in. centers, mounted on an extra heavy frame, is dragged along the canal bottom. Motive power is furnished by two teams, one on each bank. The teams are hitched to steel cables, which are fastened to the tongue of the harrow. The rotating blades cut the moss loose and also create a trowellike action, which plasters the sides and bottom of the canal, thus reducing the friction of the water on the canal banks and bottom.—Ivan E. Houk, Denver, Colo.

Stepladder Improvised with Two Chairs

One is often in need of a short stepladder for hanging pictures or doing various odd jobs about the house. A serviceable ladder can readily be improvised from two kitchen chairs, by arranging them as shown in the drawing. One chair is placed upside down on another, and a short board laid across the two bottom rungs of the upper chair, provided these are strong enough and securely fastened so that they will sustain the weight of a person. This improvised arrangement will serve the purpose just as well as a stepladder.—L. B. Robbins, Harwich, Mass.

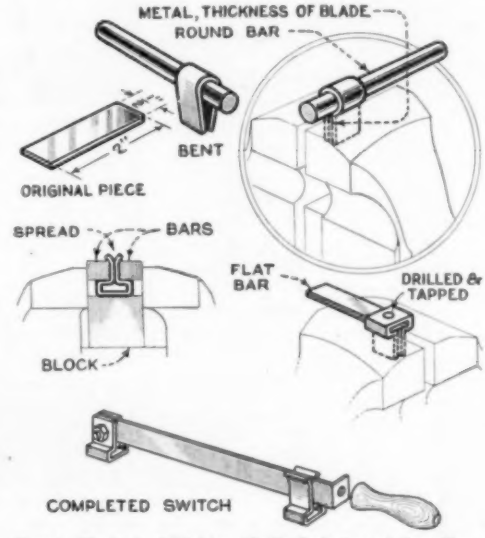
Painting Concrete or Stucco

When applying the first coat of paint to concrete or stucco the paint should be thinned out by adding 1 pt. of turpentine to each gallon of paint, as purchased in the store. The second and third coats

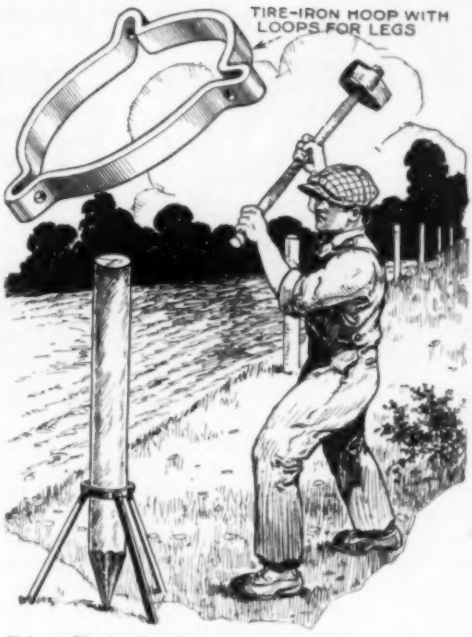
should have the usual consistency. If this is done, it will be found that the paint will stick longer than if the first coat were heavier. Paint applied to concrete garden forms also improves their appearance, and, of course, decreases deterioration.

Homemade Knife Switches

Wishing to construct a switchboard and desiring to be as economical as possible, I devised a way to produce my own switch jaws and hinges. The knives themselves, of course, presented no problem. Copper, known as ribbon or flat bar, about No. 16 B. & S. gauge and ½ in. wide was used for the hinges and jaws, each formed from a piece 2 in. long. To shape them, I put a short length of 5/16-in. round stock in the vise and bent each 2-in. length around the end of it to form a closed "U." In the case of the jaws, I then inserted the bar and "U" in the vise again and squeezed the ends of the "U" together, next the bar was removed and the round upper part flattened and made square by inserting in it a bar, about ⅜ by ⅛ in., as shown. The final shaping of the jaw is clearly illustrated in the center left-hand detail, the projecting ends of the jaw leaves being spread with a punch. The hinges were made in the same manner, except that in the shaping a piece of metal the thickness of the knife blades was inserted between the ends to keep them apart. Both hinges and jaws were drilled and tapped in the flat bottom for an 8-32 screw, and the hinges also through the sides for a similar screw. For final assembly on the switchboard, the completed parts were retained by machine screws entering from the rear; the arms or blades were cut to length, and their ends bent to receive a handle shank, with an appropriate thread. Any assembly from a single-pole, single-throw switch to any multiple-pole, double-throw switch may be constructed in this way. —Paul E. Garber, Washington, D. C.



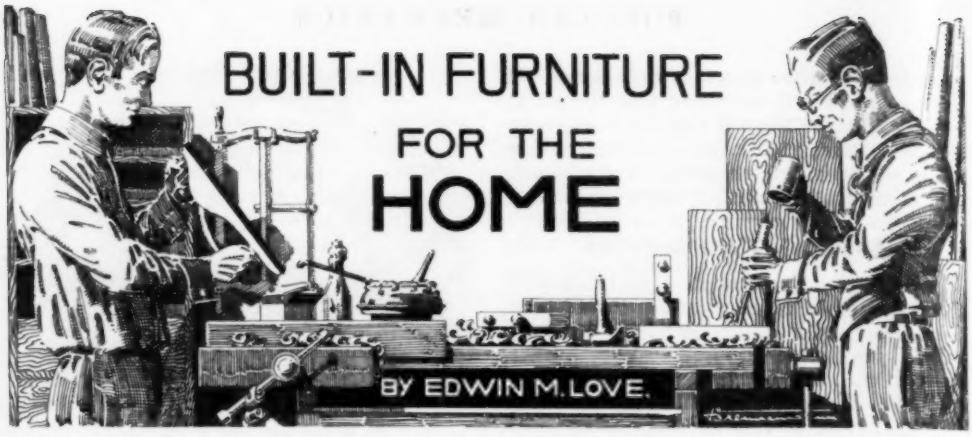
Simple Method of Making Knife Switches of Any Type from Strips of Copper



Tripod Holder for Fence Posts Enables One Man to Drive Them In

Driving In Fence Posts

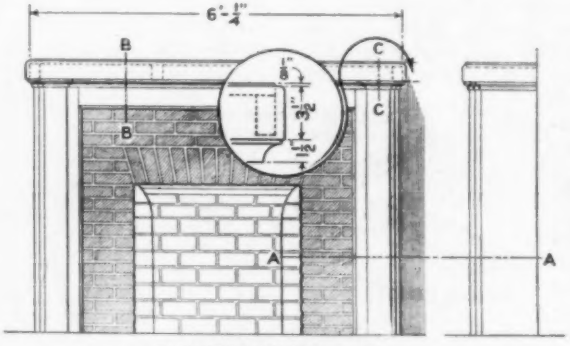
When driving fence posts, it is usually necessary for one man to hold the post while the other wields the sledge. Aside from the danger, the work requires two men whereas it could be as readily accomplished by one with the aid of the tripod shown in the illustration. A length of tire iron is bent and welded in the form of a circle, then heated again to allow the drawing out of three open loops. A ¼-in. hole is drilled through the sides of each loop and three supporting legs are fastened, as indicated, by means of bolts. After the ends of the legs are sharpened the tripod is ready for use. Placed upon the ground with the hoop directly above the desired location for the post, the post is inserted in the holder and easily driven down.



Part IX—Building Mantel Shelves

FROM the very nature of its purpose the fireplace is of great prominence in the room it occupies. Whether faced with stone, brick or tile, the mantel shelf topping it should be as simple as is consistent with the treatment of the room, so that it will be neither too prominent nor unduly subordinated. The design illustrated is adaptable to a wide range of fireplace construction, whether built out into the room or flush with the wall, and it lends itself well to combination with other pieces of built-in furniture, such as a writing desk and bookcase.

The drawing illustrates a fireplace faced with brick, projecting one foot from the plaster, with a total width of 5 ft. 9¾ in. and a height of 4 ft. 7⅛ in. The woodwork consists of a shell that is practically self-supporting, being fastened to the brick only by two plugs in the brick behind each front stile. Glue up the shelf top out of 1 in. by 12-in. stock and 1 in. by 5-in., cut 6 ft. 2 in. long, driving corrugated fasteners in the underside and leaving it in the clamps until thoroughly dry. Glue up the end pilasters by tacking and gluing a strip on the back edge of each, giving a rough width of 13 in. and a length of 4 ft. 3 in. Using 1 by 4-in. stock, glue up corner posts from a combination of front and end stiles mitered the full length of the corner, with 4-penny finish nails driven from both directions. While these are drying make a top rail, forming an apron, of 1 by 6-in. pine, cutting it to a rough length of 4 ft. 10 in. and working a double tenon on each end, making each ¾ in. long, ¼ in. thick and 1⅞ in. wide, with a space of ¾ in. between, the lower tenon being ½ in. from the lower edge. If the stock happens to be too narrow to get a full width of 5½ in. it can still be used, since the upper edge hides behind the cove mitered around the lower edge of the fascia. The length of the rail from shoulder to shoulder is 4 ft. 8¼ in. The mortises to fit the tenons are made in the face edges of the inside front stiles. Assemble the rail with these stiles, tacking a strip on the bottom to keep them properly spaced. The double mortise and tenon joint is necessary not so much to brace the front of the shell, which has support from the brickwork, but to keep the joint from shrinking open and the rail from warping enough to lift the ends from the plane of the stiles. For each inside front stile two ⅜-in. wooden plugs are put in the brick face between the fifth and sixth courses and the tenth and eleventh, 5½ in. from the ends of the brickwork. Holes can be drilled with a ⅜-in. cold chisel or star drill, care being taken to avoid loosening or cracking the bricks.

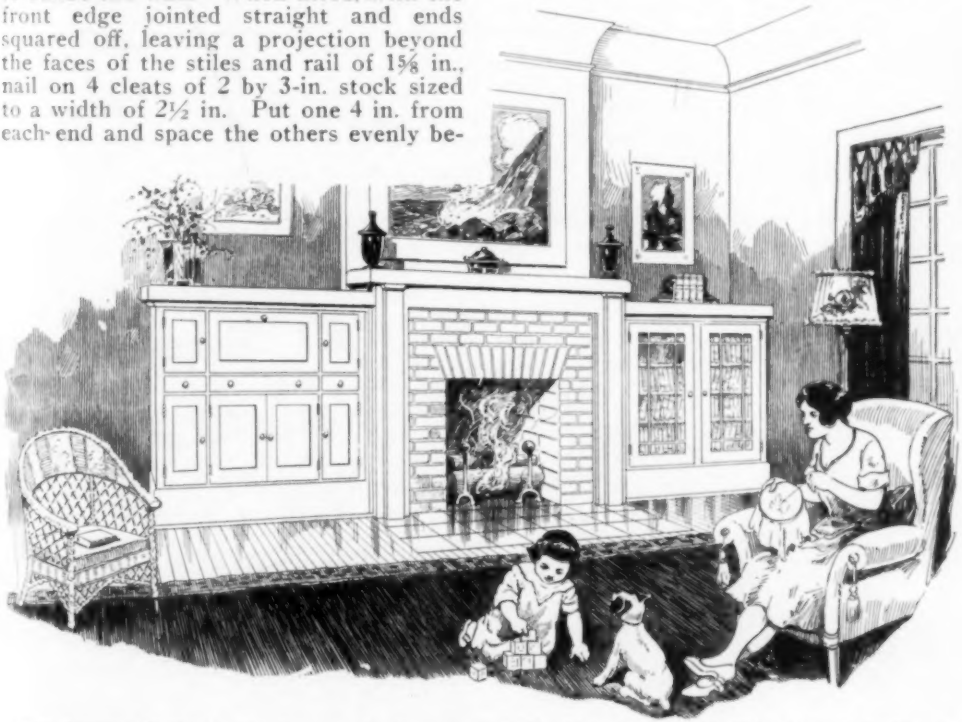


ELEVATION OF FIREPLACE AND MANTEL SHELF

The front pilasters are ¾ in. thick and 5 in. wide. Gauge a line 2 in. from the inside edges of the rail stiles and glue and nail the pilasters to the stiles, guiding on the lines, and nailing through the backs with 6-penny finish nails driven at various angles. In the same way attach the corner posts, leaving a projection on the front of 1 in. Set the frame in position with the rail level and the stiles plumb, and scribe the lower ends to the floor so that when cut off the height of the stiles will be 4 ft. 2¾ in. Nail the frame to the plugs, wedging it ¼ in. away from the brick face with strips of wood. If possible, make it plumb, but if the brickwork is badly settled keep the stiles parallel to the fireplace front.

Scribe the end pilasters to the walls, showing a margin on the end stiles of 1 in., and after ripping and fitting to the floor nail on the inside cleats 11¼ in. long, placing them to clear the stile and the 1¼-in. wall cleat previously nailed plumb as backing for the rear edge of the pilaster. These cleats are not to be glued. Nail up the pilasters and be sure that the upper ends are level with the stile ends. Lay blocks on the top of the brickwork and put the top board in position so as to scribe the wall. When fitted, with the front edge jointed straight and ends squared off, leaving a projection beyond the faces of the stiles and rail of 1⅝ in., nail on 4 cleats of 2 by 3-in. stock sized to a width of 2½ in. Put one 4 in. from each end and space the others evenly between. To get the top level in all directions it may be necessary to reduce the cleats at certain points and to wedge them up at others. Toenail into the wall at the back and toenail into the ends of the stiles and pilasters.

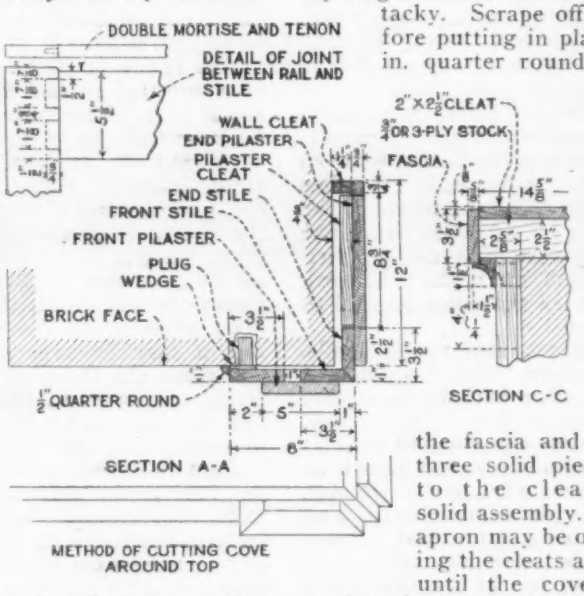
The fascia is ⅝ in. thick and 3½ in. wide, mitered around the top with a margin of ⅛ in. above. Nail every 10 in. with 6-penny finish nails and nail the bottom edge into the ends of the cleats. The front fascia may be glued, but it is a question whether gluing the ends is worth the effort. It is necessary to size the end grain, and, if the top material is poorly seasoned, which is likely to be the case, shrinkage will check the ends in one or more places. At any rate, with a solid top, it may be expected that shrinkage will draw the front edge away from the fascia at the ends, leaving a gap. For this reason it is preferable to use a strip of panel veneer for the top, as this is not subject to shrinkage or warping. It can be glued to the cleat without recourse to nails, thus eliminating puttying of holes. In case the finish is in stain it is sure to have a handsome grain. Three-ply ⅜-in. veneer is very suitable. Use double the number of cleats, and make them ⅝ in.



The Amateur Craftsman Can Improve the Appearance of His Living Room with This Easily Built Mantel Shelf and Built-In Desk and Bookcase

wider than those for a solid top. Show slightly less than ⅛ in. margin with the fascia, so that the ply joint will be covered, and glue carefully. Also put a backing cleat on the wall to prevent the sagging of the back edge.

The molding underneath the fascia is 2-in. cove, which is usually 1½ in. net. Miter the cove around the front and inside edges of the pilasters and cope the rail length between. Because of the shortness of the pieces returning around the stiles and pilasters at the corners, these may be mitered, but they should be glued as well as being nailed with small brads. It is useless to use glue without previously sizing the end grain. For this it is sufficient to give a coat of liquid glue and allow it to dry until not tacky. Scrape off any surplus before putting in place. Miter a ½-in. quarter round around the inside edge of the stiles and rail. It will be seen that the mantel shelf can be built without use of a shell or housing for the brickwork. In this case the upper rail can be mitered entirely around the brick and the fascia and mold applied in three solid pieces, being nailed to the cleats to form a solid assembly. Or even the rail apron may be omitted by widening the cleats and lifting the top until the cove can be nailed against the cleat ends. The molding must lap on the brick for about ¼ in. or more.

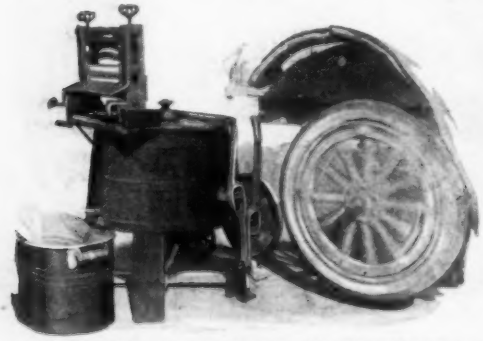


MATERIAL LIST

1 pc. 1 by 4 in. by 18 ft. pine or fir, S4S, sanded.
1 pc. 1 by 6 in. by 10 ft. pine or fir, S4S, sanded.
1 pc. 1 by 5 in. by 6 ft. pine or fir, S4S, sanded.
1 pc. 1 by 12 in. by 12 ft. pine or fir, S4S, sanded.
1 pc. 2 by 3 in. by 4 ft. pine or fir.
1 pc. 2-in. cove 10 ft. long.
1 pc. ½-in. quarter round 12 ft. long.
1 pc. ⅝ by 4 in. by 10 ft. round-edge wainscot cap.
1 lb. 6-penny finish nails.
A few 1-in. brads and 4-penny finish nails, and corrugated fasteners.
Cost of materials, about $3.50.
Time to build, about 16 hours.

Auto Runs Washing Machine

On the farm a number of power uses can be found for the automobile. The photo shows how a washing machine can be run by means of a friction drive from the rear wheel. Of course, the rear end of the car is jacked up to raise the wheel from the ground. It is a good idea to stretch a rubber band, cut from an old inner tube, over the face of the washing-machine flywheel to increase its friction so that less pressure will be required against the tire.



Friction Drive from Auto Runs Washing Machine

Effective Cleaning Fluid

In cleaning and pressing garments at home, one often finds stains or spots that will not yield to ordinary treatment. One of the cheapest and most efficient solutions can be made by dissolving half a bar of ivory soap in an approximately equal amount of ammonia; when the mix-

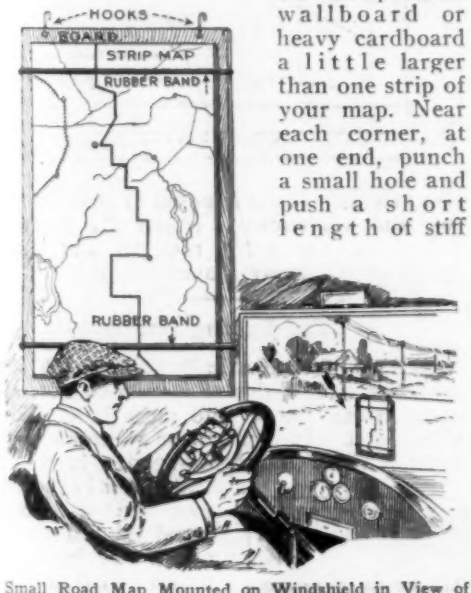
ture has assumed the consistency of a thin jelly it is ready for use. Rubbing with a small cloth saturated with it, will remove spots of most kinds from washable fabrics without injuring the material.—G. E. Hendrickson, Argyle, Wis.

Killing Butterflies

Potassium cyanide is more or less dangerous to use for killing insects because it is such a deadly poison and is also fatal when inhaled. A safe substitute which can be found in any home, and is just as effective, is ordinary gasoline. By applying a few drops to the head of a butterfly or moth, death is instantaneous without any struggle or flap of the wings, so that these are unharmed. The gasoline is applied with a small camel's-hair brush.—L. W. Barnes, Durham, N. C.

Windshield Map Holder

The popularity of the strip map for auto tourists makes the holder shown in the illustration a great help. Take a piece of composition wallboard or heavy cardboard a little larger than one strip of your map. Near each corner, at one end, punch a small hole and push a short length of stiff



Small Road Map Mounted on Windshield in View of Driver Is Convenient for Auto Tourist

wire through it, bending each end to form a hook. Now get two rubber bands for the ends of the board to hold the map in place. Hang the hooks over the windshield so that the map is always in view of the driver and out of his way.—U. B. Stokes, Denver, Colo.

Keeping Out the Flies

Flies can be kept out of the kitchen effectively by a screen arrangement above the door as shown in the photo. It was

Attachment on Screendoor Prevents Flies from Getting into Kitchen

found that more flies get in over the top of the screendoor than through the side. To prevent entrance over the door a quarter-circular screened frame is attached over it so that there will be no gap at the top. A triangular screen is fastened vertically on the edge of the door and swings with the door when it is opened. A leather strip is fastened onto the top of the door so that there will be no opening for the flies at the top and another strip is tacked to the upper edge of the vertical screen to prevent flies from getting in at the side.

Making Erasures in Typewriting

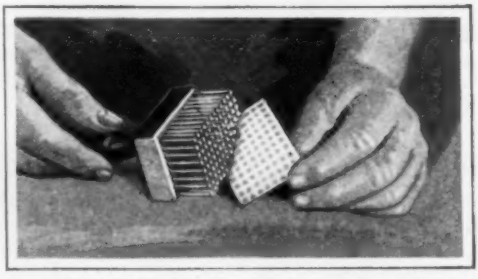
When an error has been made in typewriting, I have found it good practice to backspace and type the correct word over the wrong one before attempting to erase. This tends to raise the surface of the parts of the paper imprinted with the wrong letters, and makes erasure much easier. The entire operation of retyping the correction and erasing the wrong one takes less time than the usual method.—Elmer Hufferd, Rushville, Ind.

¶ The spring and stem of a plunger valve can be removed when the threaded part of the plunger is broken off, by holding a lighted match on the end of the valve to melt the rubber, and striking the valve on a board to make the stem fall out.

Above, Rotary Platform with Eight Booths for Still-Life Settings; Right, Combination Chair and Easel

Revolving Stage for Art Students Aids Still-Life Class

So that commercial-art students may have the best possible settings of still-life objects for drawing and painting, a circular-stage arrangement has been made that will accommodate as many as twelve persons and will hold eight different subjects. The entire stage is subdivided into the latter number of small booths, each artificially lighted from within and hung with drapery of gray-green velvet, to afford a neutral background. Should the student wish to continue his work the following day, he merely switches off the lamps, leaves the set and when he returns to it, he finds the same lights and shadows as it had the previous day. Easels are conveniently arranged on adjustable stands. The inventor of the stage has also devised a combination chair for artists. It has a rack for colors, water, crayons and other implements, a shelf for books and a rest for the drawing board. The chair itself is rigid, has a comfortable back, and the entire assembly is constructed to avoid shaking and vibrations. When the rack is folded in, the outfit requires but little space and is easily moved about.



Simple Device for Applying Paste to Labels Does the Work Quickly and Neatly

Label-Pasting Device

Pasting labels is usually a sticky job but with the simple device shown in the accompanying photo, the mess is entirely eliminated. It consists of a number of bank pins stuck into a wooden block of suitable size, the pins being spaced equal distances apart. A knob is provided on the other side of the block to enable the operator to handle it with ease. In use, the pins are dipped into a dish of paste and then pressed against the back of the labels as indi-

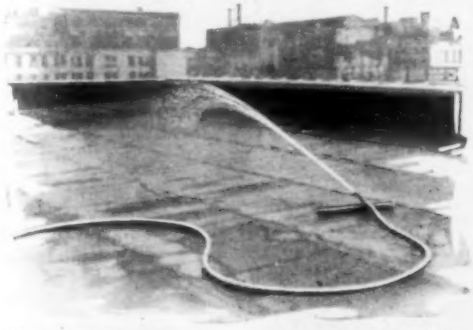
cated in the photo. This puts enough paste on them to make them stick over the whole surface, and the time consumed in doing it is much less than that required when pasting them on in the usual way. The device is cleaned easily by rinsing it in water. It can be used in the same way for applying water to gummed labels.—E. W. Cornell, Adrian, Mich.

Protecting Electric Lamps from Vibration

In a certain mill a new lighting system was installed, with the fixtures suspended on metal conduit. The vibration from the machines, in the department itself, and on the floor above, frequently caused the filaments in the lamps to break and renewals were so frequent that the cost was excessive, thus offsetting some of the advantages gained by the new installation. Coil springs were tried, but these permitted the fixtures to sway, which was objectionable. The problem was finally solved by placing soft-felt washers in the top of the canopy aliners, to separate the cast-iron cone from the bushing into which the conduit is screwed. The washers were resilient enough to absorb all vibration without permitting the fixtures to swing. —H. M. Toombs, Chicago, Ill.

Cooling Office on Upper Floor

On hot summer days the top floor of an office building was rather uncomfortable due to the absorption of heat by the roof. Considerable relief was experienced when the roof was kept wet with a stream of



Keeping the Top Floor of an Office Building Cool during Hot Summer Months

water sprinkled over it with an ordinary garden hose, the water being applied just fast enough to keep up with the evaporation. The offices just below the roof were about 8° to 10° cooler than the offices on the top floors of adjacent buildings.—Ivan E. Houk, Denver, Colo.

Corn-Shock Tightener

Binding corn shocks is easily done with a simple device of the kind shown in the drawing. It consists of a broom handle,

Binding Corn Shocks Facilitated by Homemade Tightener

about 3 ft. long, and a length of sash cord provided with three steel hooks, as shown. In use, the cord is whipped around the shock and one of the hooks is slipped over the handle about 10 or 12 in. from the end. By pulling the handle toward himself, the user causes the hook to slide down to the end and the cord is drawn tight. The handle may then be turned downward, the cord holding the shock together while it is being bound with ordinary twine. The tightener is released by lifting the handle so that the hook can be detached.

Cleaning Spark Plugs

Few car owners "enjoy" disassembling spark plugs and laboriously removing carbon particles with a knife and scraper. A good method of doing this is as follows: Immerse the plugs in a fruit jar, partly filled with muriatic acid; the length of the bath may be from 10 minutes to an hour, depending on the strength of the acid and the condition of the plugs. Afterward, wash the plugs in water. Heat treatment is another good method of cleaning spark plugs. The plug is taken apart and the porcelains are placed in a hot lye bath, a saturated solution being used. The shells are placed in a fire, heated almost red and are then plunged in cold water.

Loosening Tight Covers

It often happens that screw covers on mustard, jelly and other jars are extremely difficult to remove. This can often be

An Obstinate Screw Top Is Loosened by Heating the Edge with a Lighted Match

overcome by holding a lighted match under the cover, as shown, and rotating the jar to heat the edge all around. This expands the cover and allows it to come off easily.—Mrs. A. Mathieu, Chicago, Ill.

Making a Small Study Desk

A student found himself in need of a study desk and resourcefully provided himself with one by utilizing his dictionary stand. He obtained a piece of heavy plaster board, 25 by 30 in. in dimensions, and covered it with a heavy dark oilcloth. On the underside of the board, about 8 in. from one of the longer sides and parallel to it, he screwed on a wooden slat. Then, removing the dictionary from the stand and opening the binders wide so that they lay flat, he placed the board on the binders so that the slat on the underside fitted snugly against the projecting flanges at the bottom of the binders. The slat tends to make the board stiff and rigid, while the opened binders provide a firm and rigid support. The small book rack at the base can be used for books as usual.—P. C. Grose, McComb, Ohio.

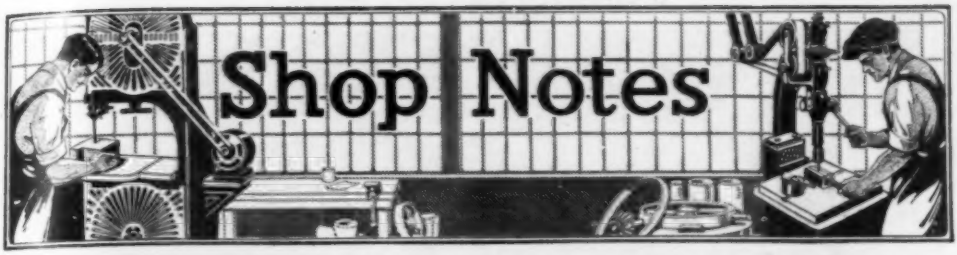
Handy Improvised Study Desk Consisting of a Dictionary Stand and a Piece of Wallboard

A Good Crack Filler

When repairing a large building having wooden floors, which were badly checked from exposure to the weather and lack of paint, the workmen made a filler in the following way: They took the best grade of putty, thinned it down with a good light machine oil and then added plaster of paris until the putty was restored to its original consistency. This mixture was worked into the cracks with a putty knife, and when dry, was found very hard and tough, drying much more quickly than putty. The material projecting above the floor was sandpapered down, and when painted, the floor looked as good as a new one. Only a small quantity should be mixed at one time, as the plaster of paris sets quickly.

Adjusting Wheel Bearings

In adjusting Ford front-wheel ball bearings it is often found that when done, the locknut stops between two castellations and cannot be turned to the next opening for the cotter pin. The remedy is to grind or file off the back of the locknut until it can be turned to replace the pin. As there are eight openings in these nuts, only a small portion need be removed. For my own use, I keep two pairs of locknuts, two for each spindle. One pair is ground off slightly on the back as described above, and the other pair is the original thickness. The ground nuts are marked with a center punch. When adjusting wheels, I try the nuts in turn and usually find one which stops at the cotter-pin hole without trouble or grinding. Using two nuts of different thicknesses is a timesaver.—E. Gunderson, Humboldt, Ia.

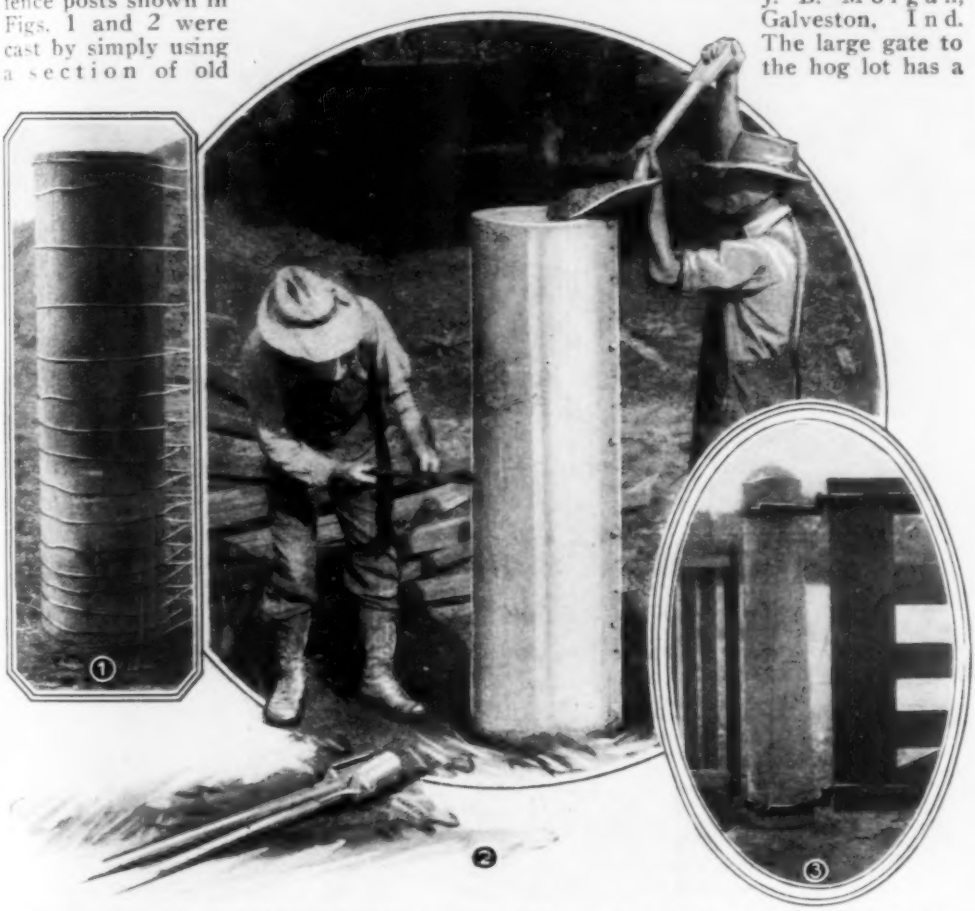


All Shop Notes published in 1924, in book form—Fifty Cents—from our Book Department

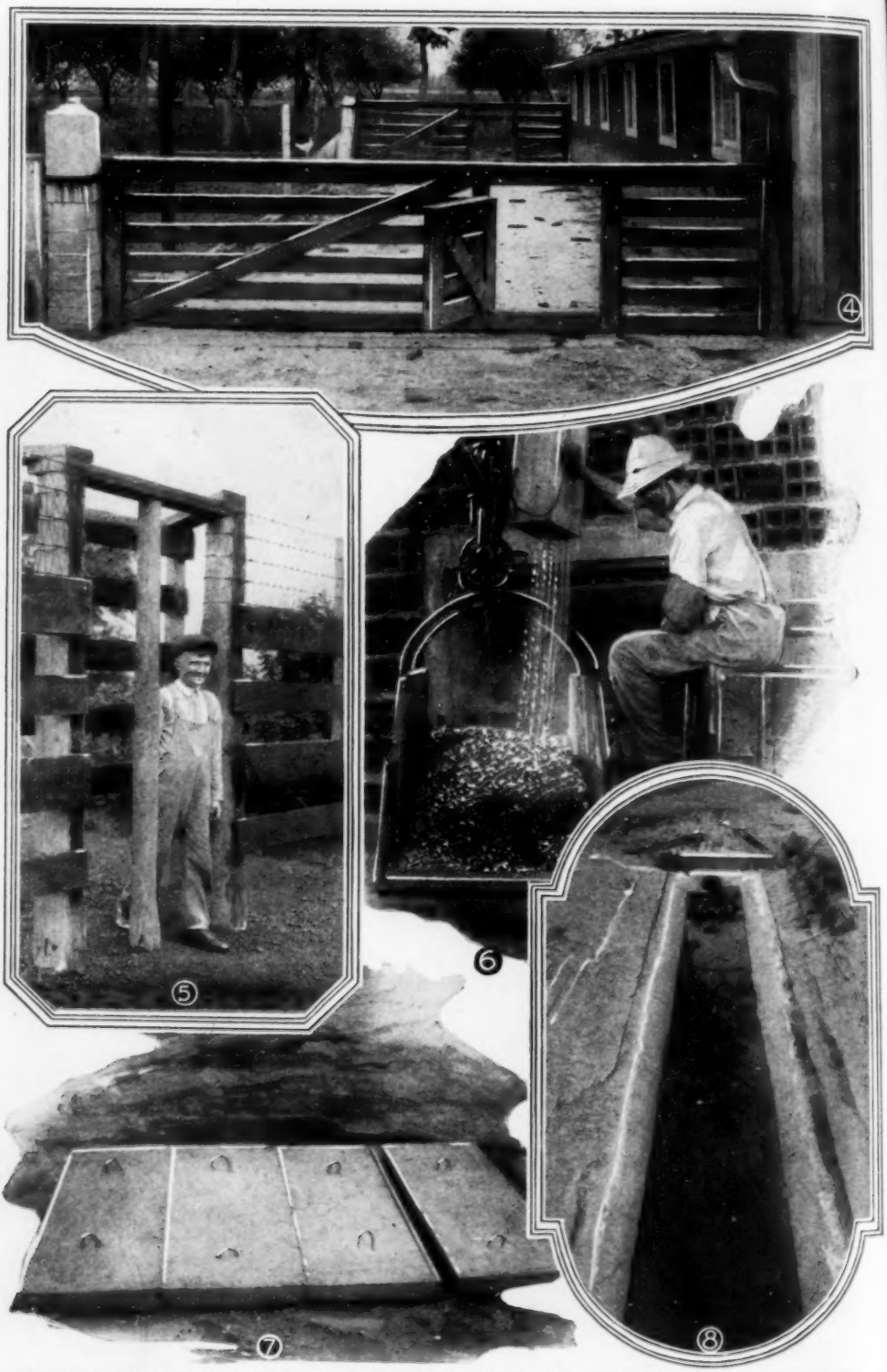
Kinks for the Farmer

By J. C. ALLEN

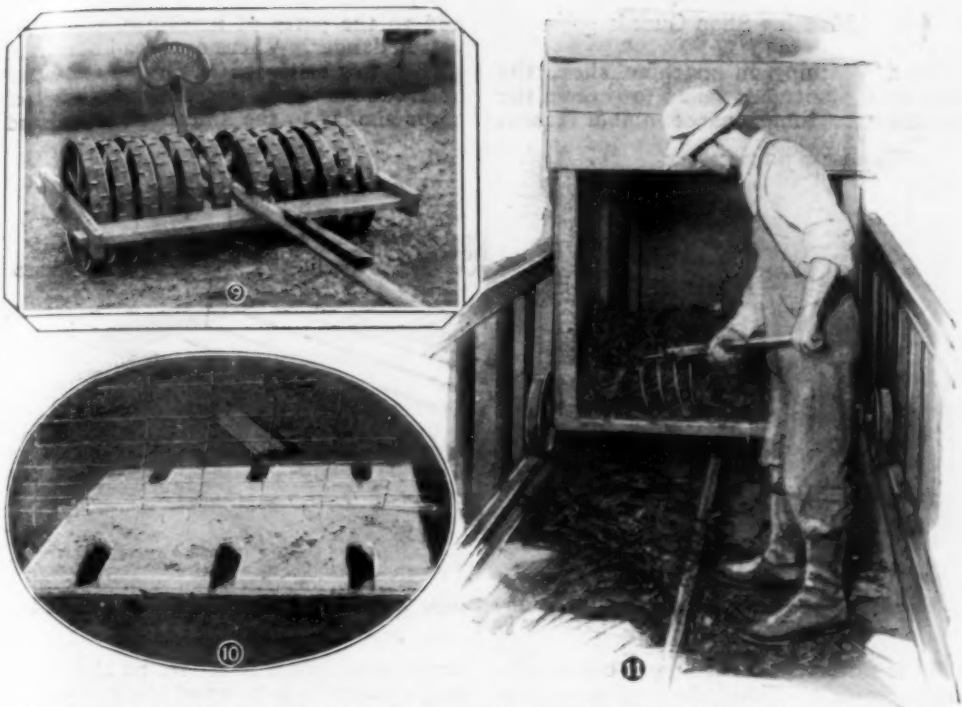
THE kinks shown in the accompanying illustrations need very little description, as the photos show about all there is to them. All of them have been tried out by practical farmers, and are in daily use, so there is nothing experimental about the ideas. The very substantial fence posts shown in Figs. 1 and 2 were cast by simply using a section of old blower pipe as a form; the method of fastening the fence wires is shown clearly in Fig. 1. Fig. 3 shows a gate post cast in a similar manner; the hinges are adjustable so that they can be raised to take out any sag that may develop in the gate. Fig. 4 shows an idea that is in use on the farm of J. B. Morgan, Galveston, Ind. The large gate to the hog lot has a



Making Substantial Fence Posts by Pouring Concrete into an Old Blower Pipe; Right, Concrete Gate Post with Adjustable Hinges to Compensate for Sag



Various Practical and Simple Kinks for the Up-to-Date Farmer: Kinks That Make the Work of the Farm Lighter, Keep the Place Neater and More Sanitary, and That Save Time for the Busy Worker



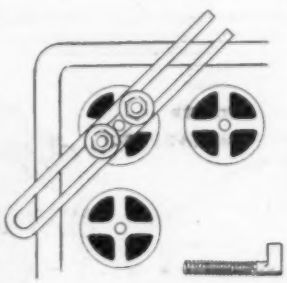
Upper Left, Homemade Roller Using Discarded Wheels; Lower Left, Sanitary Watering Tank for Both Hogs and Sheep, and Right, Convenient Method of Feeding Silage

smaller gate set in it, so that the larger gate need not be opened to allow the hogs to pass in or out. Fig. 5 shows a "man creep" installed in the fence at the stallion paddock of the University of Illinois. No one can accidentally leave this "open." In Fig. 6 is shown the handy method by which Numan Shaw, Scratton, Iowa, fills his feed carrier for fattening steers, and Fig. 7 the covers on the septic tank at the country home of T. R. Johnstone at W. Lafayette, Ind. These sectional covers are easily made, and each section can be taken off by one man, whereas a one-piece cover, if at all substantial, would be very clumsy. Fig. 8 illustrates a concrete hog wallow along a string of tile on the farm of Chas. Houghton and Son, Carlisle, Ind.

Discarded implement wheels form the basis of the homemade roller shown in Fig. 9; these are mounted on an axle in a simple wooden frame, provided with a mower seat and tongue. In. Fig. 10 is seen the watering place for hogs and sheep on the farm of John Owen, of Noblesville, Ind. The tank is of concrete with a cover of the same material and extends into the two lots. A float keeps the water level with the top of the tank. Fig. 11 shows a convenient method of feeding silage devised by Taylor Fouts, of Camden, Ind. The silage cart runs on a track leading from the silo, which is located at one end of the trough, and the silage is raked out into the trough as the cart is moved along the track.

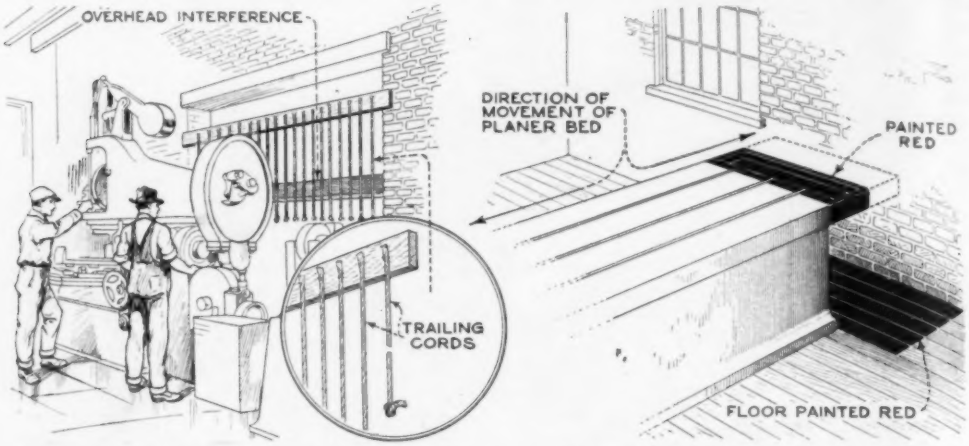
Removing Pump-Valve Seats

When changing pump-valve seats, considerable time can be saved by using the device shown in the drawing. A length of 1¼ by ½-in. flat steel is bent to a U-shape, with the sides far enough apart to allow a puller bolt to pass through. A detail of the bolt is shown in the lower right-hand corner. The head should be small enough to pass through the ports. Two of these bolts are used, the heads being turned to catch under the ribs between the ports, and by pulling or tightening the nut a little on each bolt, the seat will come out easily.



Machine-Shop Guards

In a Washington machine shop, the stop on a planer bed failed to reverse the machine for some unaccountable reason, and to the parts of machines, which involved danger. Where overhead obstacles, such as low belts, shafts, girders and other obstructions were located, a guard of cords similar to the kind used in railroad

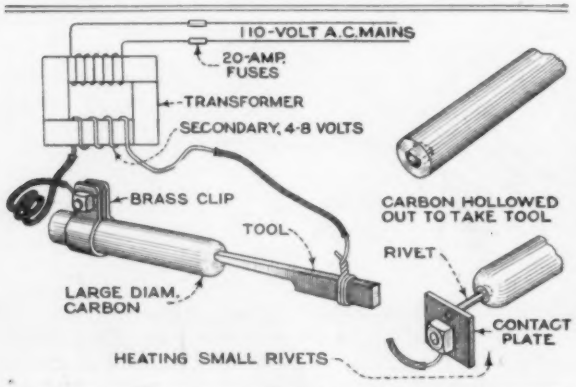


Suspended-Cord Guards and Red-Painted Areas Give Danger Warning to Employes to Prevent Injuries in Machine Shop

and the unfortunate result was the crushing to death of one of the employes, who stood between the end of the planer bed and the brick wall. To eliminate similar accidents in places where the use of guardrails is impractical, red paint was applied to the dangerous areas of the floor yards, was found effective, as the workman's attention is arrested the moment he encounters the cords, which are situated a few feet from the dangerous place. These warning signals are not necessarily confined to machine-shop practice, but are of equal use in other shops.

Hardening Small Tools Electrically

Lathe tools, punches, awls and similar small tools may be hardened quickly and without the use of a fire by means of a single-phase transformer of small capacity; one of about 150 watts, connected to a lamp socket, will do the work. Such a transformer may be heavily overloaded for a few moments without injury to the windings, and as a tool can be heated red-hot in about a minute, a regular welding transformer is unnecessary for this purpose. Obtain an arc-light carbon, preferably ⅞ in. in diameter. Drill a hole, just large enough for the end of the tool, in one end, and attach a heavy brass clip, fitted with a brass bolt and nut to which one of the transformer secondary leads is clamped, to the other end. The other terminal is wrapped around the outer end of the tool and held securely in contact by means of a pair of heavy tongs. The end of the tool is pushed into the hole in the end of the carbon and the current switched on. The carbon will immediately grow first red and then white-hot, and the end of the tool will also quickly become red; it should then be removed, quenched in water, and



Heating Small Tools and Rivets for Hardening with a Small Transformer and an Arc-Light Carbon

tempered in the usual way by drawing to the color required, preferably in the flame of a small Bunsen burner. The end of the tool is inserted into the carbon to prevent it from becoming too hot and melting away, which would happen if only the point came in contact with the carbon. For this reason it is also best to have the tool in the hole before making the electrical contact, and to leave it there until after the current has been turned off. Small rivets can also be heated red-hot in this way, only they are held by means of a small brass contact plate, with a hole drilled in it for the rivets, connected to one of the secondary wires. The rivets should butt against a heavy nut screwed on a bolt passing through the plate; this also serves to attach the connecting wire. The transformer secondary should be from 4 to 8 volts, and the winding made up of at least two No. 14 d.c.c. copper wires in parallel, or their equivalent. The windings of the coils should be felt occasionally, and if too hot, the current should be switched off until they are cool.

Pulling Up the Hay Fork

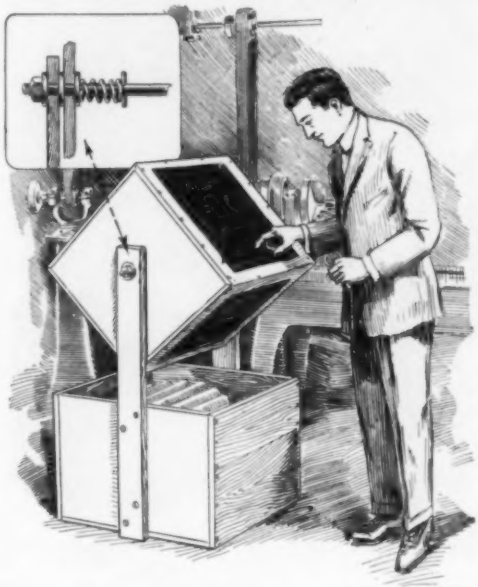
A convenient hitching arrangement for pulling the hay fork when putting up hay is shown in the photo. It consists of a U-shaped rig, made from two round iron bars and held in place by the collar and a hip strap. The rope to the hay fork is looped on the lower branch of the rig and slides readily around it when the horse turns. There is no singletree or doubletree to bump against the horse's heels, nor anything for the driver to hold up

Improved Hitching Arrangement for Pulling Up the Hay Fork

on the return trip. The left-hand photo shows the horse going out with a load and the right-hand photo starting back for another trip.

Revolving Blueprint Stand for Use in Shops

It is not uncommon to see shop blueprints so dirty, creased and torn that they are practically useless long before the job



Blueprint Stand for the Shop Prevents Them from Being Torn and Becoming Dirty

is finished. This is mainly due to the fact that there is no convenient place in the shop where the drawings can be laid. They may be spread out on the bench, on some part of a machine, or perhaps on the floor, but in any case they are liable to be soiled and torn. A simple drawing stand, which has been found useful where the practice is to have detail drawings on separate sheets, is shown in the illustration. To make this stand, obtain two empty boxes of suitable dimensions. Use one box for the base of the stand and fasten two pieces of wood to it vertically, one on either side. The other box is pivoted between these uprights on a round steel bar, as shown. The coil spring on the axle inside the second box will hold it securely in position for referring conveniently to any of the four drawings tacked to the outside. If the box revolves too freely after some time's use, it is only necessary to tighten up the nut on the spring end of the axle.—Harry Moore, Montreal, Canada.

Electric Lamps and Trays Filled with Kerosene Have Proved Effective Traps for Injurious Insects

Trapping Orchard Insects

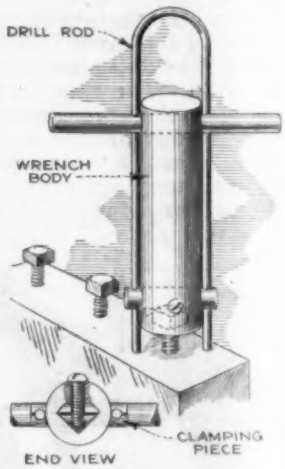
A moth trap devised by an experienced fruit grower near Swedesboro, N. J., is arousing interest among the neighbors. The trap is based upon the fact that bright lights attract insects. It consists of an electric lamp, attached to a pole about 3 ft. above the ground, and a round, shallow pan placed a few inches below it, as shown in the photo. The pan is filled with kerosene, which kills all insects that fall into it. There are 125 of these lamps in a 60-acre peach orchard. Myriads of insects, which flutter about the lights, have been caught in these traps. The prime object was to catch the oriental moth, which is the latest and most destructive of the fruit-tree pests that orchard owners in the east have to contend with. They and their grubs attack only peach trees, feeding on the tender shoots and fruit, and the usual poison sprays have proved entirely ineffective in checking them. Since the installation of these traps, there has been a considerable decrease in the number of moths. A possible disadvantage of the equipment is that, unless neighboring orchards are also provided with similar traps, insects from them may overrun the protected place.—J. G. Sholl, Pitman, N. J.

Treatment of Boat Lumber

Wood used in the construction of boats should be given the following treatment according to an old experienced boat builder. The lumber should be placed on supports outdoors, where the sun can get at it. Every day a coat of pure linseed oil is applied to the surface and allowed to soak into the wood. This treatment is carried on each day for a week or until the wood is thoroughly impregnated with the oil. Boats made of lumber treated in this way have withstood water and exposure for over 25 years, with only two or three coats of paint during this time. An ordinary paintbrush is used to apply the oil. After the boat has been built it is given two coats of regular paint as usual, but no paint is applied to the wood before.—Clyde E. Volkers, Terre Haute, Ind.

Wrench Fitted with Gauge for Setting Screws

The unusual box-wrench gauge shown herewith was devised to facilitate the setting of square-head screws a definite height above the surface into which they are threaded. It consists of a single piece of drill rod, bent to a U-shape and passing through holes in the handle and through a clamping piece, set in a hole drilled just above the socket, as shown. This piece is drilled and tapped in the center, at right angles to the drill-rod holes, for a screw, and split in two.



The screw passes through a clear hole in the wrench body, as indicated in the end view. By loosening the clamp screw, the U-rod can be slid up and down and then clamped again to drive screws so that their heads will be on the same level.

¶Aluminum can be melted in an ordinary crucible, but a flux should not be used, as a chemical combination will likely result.

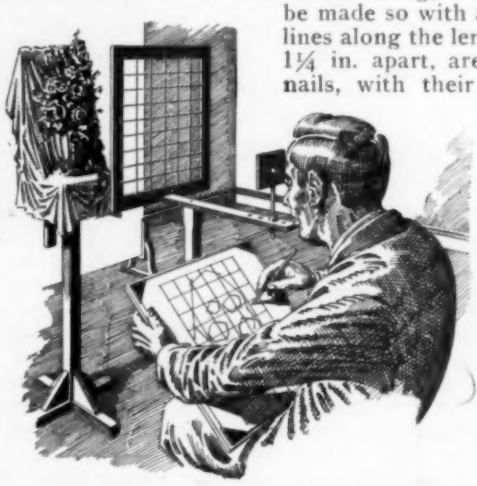
Spring Made from Magnet Wire

I greatly needed a small coil spring, but upon investigation found I had nothing in the way of wire but No. 20 copper magnet wire. This had no spring to it, and was useless until I gripped one end of a length of it in a vise, and the other end in the chuck of a hand drill. Turning the drill and twisting the wire until it was about ready to break made it springy. In doing this, it was necessary to keep the drill in line with the wire to prevent it from breaking.—Dexter W. Allis, Everett, Mass.

Making Perspective Drawings

The beginner's difficulty in making correct perspective sketches lies in the fact that, in looking from drawing board to object repeatedly, his eye is not always in exactly the same position. As a teacher of architectural drawing I devised the apparatus shown in the illustration, and found it very useful in overcoming this trouble, as it assures viewing the object from the same point and furnishes reference lines for the easy location of all parts of the object. It is made from an ordinary slate frame with fine threads stretched across it in both directions and at equal intervals, as shown. At right angles to the lower edge of the frame a wooden cross arm is attached, and in it are drilled a number of holes to receive a small rod holding a cardboard target with a peephole in the center. The edges of the frame may be marked with letters and numerals so that each square formed by the wires can be easily found. The device can either be set on a table or fastened on a pedestal.

In use, the student rules off vertical and horizontal lines on the paper to correspond to the threads on the frame, and by looking through the peephole, he is sure to make his sketch from the same point of view. By moving the target toward or away from himself, he establishes the vanishing point at a greater or less distance.—F. W. Fitzpatrick, Evanston, Illinois.



Novel Frame, Divided into Squares with Taut Threads, Aids Beginners in Sketching Perspectives

A Lawn Renovator

A slight root pruning is just the thing to put life into an old lawn, and a tool especially adapted to this purpose is a spiked roller. Besides, it will loosen up the bare spots so that they will retain seed without the necessity of spading. Such a tool can easily be made from a section of a log, which, if not round, can be made so with a drawshave. Parallel lines along the length of the log, spaced 1¼ in. apart, are ruled and 20-penny nails, with their heads removed and filed flat at this end, are driven into the wood, also 1¼ in. apart. To add weight to the roller iron disks can be attached to each end with a lag screw in the center and nails driven around their circumference. The lag screws also serve as bearings for the wooden sidepieces.—C. L. Meller, Fargo, North Dakota.

Simple Spiked Roller for Pruning Old Lawns Improves Their Appearance

Chipping Chisels: How to Use Them

By James Tate

NO mechanic is fully trained until he has mastered the art of using the chisel. By this is meant not merely employing the chisel to cut off pieces of light steel or material of similar character. The good mechanic does, it is true, use the "cold" chisel for this occasionally, but the chisel is capable of an infinite variety of much finer and better work than this; indeed, in the hands of a mechanic of the old school, it frequently had to take the place of the shaper or the keyseater, the oil-grooving machine or the slotter. The chisel is one of the oldest tools known to man, and even in this age of machine tools it retains its usefulness to the worker in metals. The principal use of the flat chisel, aside from the minor one of cutting off stock (which, by the way, can usually be done better with a hacksaw) is that of preparing the surface of castings and similar work for finishing with the file or in a machine, to cut snags off castings, to fit punches and dies and to fit castings to each other. Suppose we are in a shop where there is no shaper, or that we are erecting a machine in the field far from the shop, and that we have to remove ⅛ in. of metal from the base of a bracket; how shall we go about the job? Here is a task for the flat chisel, and its companion, the cape chisel. Using the latter first, we chip a series of grooves across the face of the casting, to a depth of a little less than ⅛ in., the grooves being not quite as far apart as the width of the flat chisel to be used. When this has been done, we use the flat chisel to remove the metal left by the cape chisel, and, when the face has been brought to a flat surface, finish the job and fit the casting to the machine with the file. A skillful wielder of hammer and chisel can do the job in less time than it takes to describe the operation, and the piece will be as well fitted as though the work had been done entirely on a machine.

Flat chisels are made in a variety of sizes of shank and blade, and of varying lengths also. The usual material is 70-point octagonal steel, and the usual shape as shown at A, Fig. 1. There is another shape that is favored by some machinists (B, Fig. 1 and perspective view) because it needs "dressing" or reforging less often than the common type. The chipping chisel should have a thin cutting edge or point, as it is usually called, and this is one reason why the mechanic who is careful of his tools is reluctant to use it as a cutting-off tool—the point is too apt to break, necessitating the dressing of the tool. The body of the tool, for average chipping, may be of ¾ or ⅞-in. octagonal steel. The cutting edge, if the tool is made of ¾-in. steel, should be ⅞ in. wide, and if of ⅞-in. steel should be 1 in. wide. The thickness of the point is a matter of taste, but it should not be allowed to become any thicker than $\frac{3}{32}$ in. before reforging or regrinding. The cutting edge should be parallel with one of the flats on the shank of the tool (Fig. 1, C), to assist in keeping the surface being

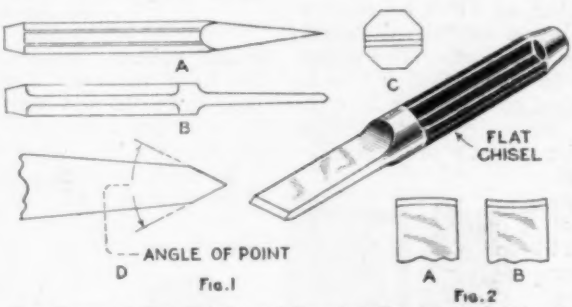
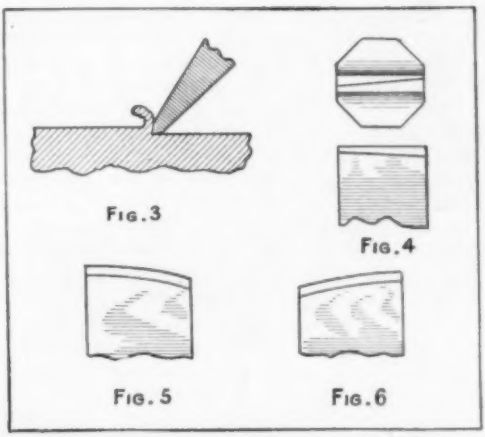


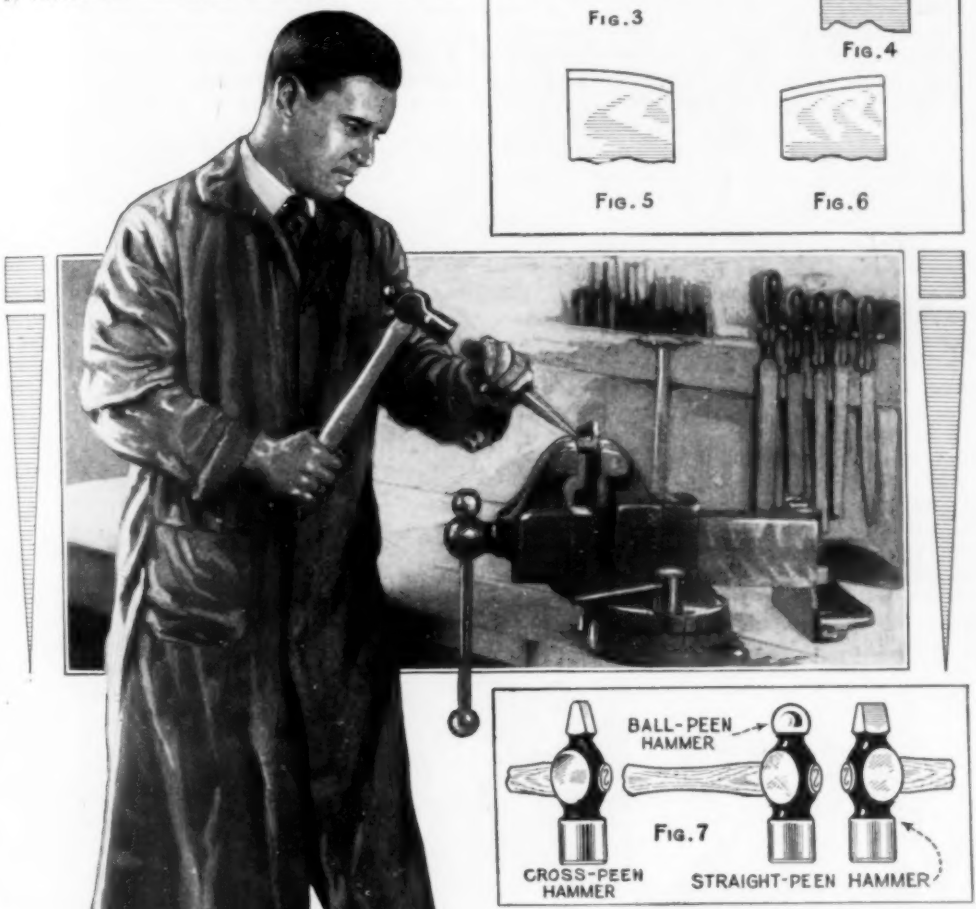
Fig. 1 Fig. 2

Two Forms of Flat Chisels, and Drawing Showing How Edge Is Ground

chipped flat, and to prevent the chisel from twisting in the hand. It will be found that the thinner the cutting edge, the easier the chisel is to hold to the cut and the better it cuts; good work cannot be done with a thick edge.

The angle of the cutting edge (D, Fig. 1) varies for different metals, just as the angles of a lathe tool are ground to suit cast iron, brass, steel, etc. For cast iron, the angle should be from 60 to 70°; for wrought iron and steel 50 to 60°; for brass 40 to 50°, and for copper, babbitt and other soft metals 30 to 40°. The angle should be just as sharp as the chisel will stand for the metal on which it is to be used.





Above, Various Faults in Chisel Grinding; Center, Position for Chipping; Below, Types of Chipping Hammers

FIG. 8

One finds chipping chisels ground in a number of ways in the shop, but in this, as in everything else, there is but one really correct way of grinding the tool. This is shown in Fig. 2, A, in which the cutting edge has a slight curve outward, the center being higher than the corners. There is a very good reason for this. When a chisel is ground in this

manner, the center of the tool commences to cut first and the corners are fed into the work more or less gradually so that there is very little tendency for them to break off. If the chisel is ground straight across it will do good work, but in grinding it straight there may be a tendency to grind it slightly hollow. When this happens, the effect is as shown in Fig. 2, B, which shows the hollow exaggerated for clearness. Here all the strain of the cut comes on the corners first, with the invariable consequence that they are broken off. By slightly rounding the face of the chisel, the danger of hollow-grinding the edge is avoided, and the strain of the cut comes in the center of the chisel first, as it should.

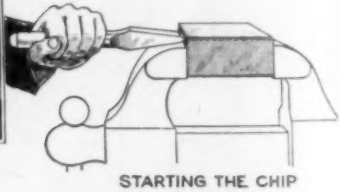
The edge should be ground so that the bevels are parallel to each other and the edge, and at right angles to the sides of the chisel, or its centerline. If the bevel is rounded, as in Fig. 3, it will be found hard to keep the edge down to the work, and the chisel will have a tendency to ride over the surface, instead of biting into the work. Also, if the bevels are ground so that the cutting edge assumes an angle across the chisel, as in Fig. 4, the chisel will twist in the hand as it is struck. If ground as shown in Fig. 5, it will work to the left, and if ground as in Fig. 6, it will work to the right; in either case no good work can be done with the tool.

It will be seen from the foregoing that there is more to grinding a chisel than merely making the edge sharp, and that it will pay the budding mechanic to give it attention.

Left, End of Swing; Fig. 10, How the Chisel Is Grasped; Upper Right, Taking the Chip, and Lower Right, the Cape or Crosscut Chisel

Three forms of chipping hammers are shown in Fig. 7. The weight of the chipping hammer depends to some extent on the work to be done, and on individual choice, and varies from ¾ to 1¾ lb. The apprentice will probably find a 1½-lb. ball-peen hammer about right for him. The face should be slightly "crowned" or rounded, and the handle should be a hickory one, about 10 in. long. The handle should not be too heavy at the "neck" but should be small enough here to give it a little spring, and thereby prevent too much shock to the wrist when the chisel is struck. This is a point that is little considered when fitting hammer handles, but it is surprising what a difference a little spring in it makes when a heavy job of chipping (or any other hammer work) has to be done.

Fig. 8 shows the proper method of standing at the vise and of holding the hammer and chisel when chipping. Grasp the hammer at the end, or as near the end as you can and still control the force of the blow. Swing the arm mainly from the elbow, and carry the hammer back as shown in Fig. 9. The first strokes should be short and light, then, as the chisel commences to cut into the work, they should be made long and heavy. Fig. 10 shows how the chisel should be held, and right here let me give the chipper a word of advice. Look at the cutting edge of the chisel when chipping. Don't watch the chisel head. If one gets into the habit of watching the edge, the hitting of the head of the chisel becomes second nature, and one need not be afraid of hitting the fingers. If, on the contrary, one becomes accustomed to watching the head of the chisel, beware of the moment of forgetfulness when one removes the eyes from



STARTING THE CHIP
Fig.11

Fig.12

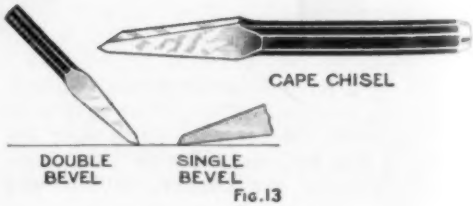


Fig.13

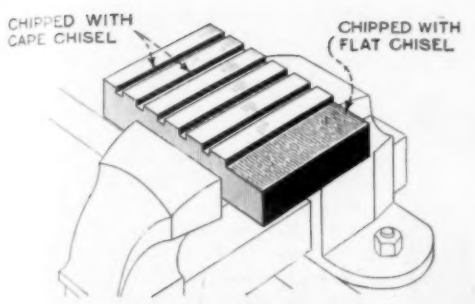


Fig 14

FIG. 15

FIG. 16

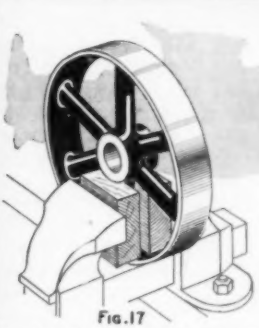


FIG. 17

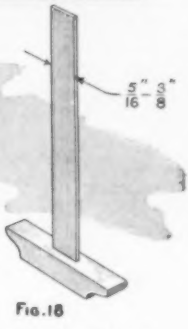


FIG. 18

Fig. 14. Chipping a Broad Surface; Figs. 15 and 16, Laying Out and Cutting Keyseat on Shaft; Fig. 17, Holding Pulley for Keyseating and Fig. 18, Keyseat Square

it while striking a blow! The loose grip of the forefinger and thumb shown helps reduce the damage if they are accidentally struck.

To start a chip on a piece of work, hold the chisel in the horizontal position shown in Fig. 11, then strike a sharp blow with the hammer; this will break off a chip on the edge of the work and the chisel can then be held in the position shown in Fig. 12, so that the lower level is at a small angle to the surface. The depth of the cut taken by the flat chisel (or any other chisel with a double bevel) depends on the height of the hand holding it. Raising the hand permits a bigger cut to be taken and lowering it allows a light cut. Stop the cut when about ¼ in. from the farther edge of the work, if the metal is cast iron, to prevent the edge from breaking off, and when the whole surface has been chipped from the near side, always stopping ¼ in. from the farther edge, reverse the work in the vise and chip off the remaining part of the surface.

When a very heavy cut is to be taken off a surface, the cape chisel will be found handy. This is sometimes known as the crosscut chisel, and is forged to the shape shown in Fig. 13. It may be ground either with a double-beveled edge or with a single bevel, although for straight chipping work, as in the illustration given at the beginning of this article, the double bevel is the more usual. A series of grooves chipped across the work will help subsequently when chipping with the flat chisel (see Fig. 14). The grooves should be spaced apart a little less than the width of the cutting edge of the flat chisel used, so as to relieve the corners of the latter from danger of breaking.

The cape chisel is also used for cutting seats for sunk and feather keys in shafts. Little of this need be done in the shop nowadays, of course, but in the field, when

erecting machinery, it is occasionally necessary to cut a keyseat in a shaft or a keyway in a pulley hub, and the machinist who can do the job in a workmanlike manner with the hammer and chisel will not regret the time spent in learning how. Suppose we have to cut a seat at the end of a shaft for a sunk key, and that the corresponding keyway in the pulley hub must be cut also. Clamp the end of the shaft in the vise as shown in Fig. 15, and, by means of a keyseat rule, or a pair of keyseat clamps applied to a scale, mark off the width and length of the keyseat. If a shallow, flat-bottomed hole of the correct diameter can be drilled at the inner end of the keyseat so much the better, but if not, we will have to make the best of it. With a cape chisel a trifle smaller in width than the key, we are to commence chipping along the marked lines of the seat (Fig. 16). If the point of the chisel is rubbed on a piece of waste saturated with oil every few moments it will be found to cut better. At the end of the cut, if there is no hole there, make a vertical cut with a small flat chisel of the same width as the cape chisel. Continue cutting until the keyseat is of the proper depth, then fit the key in place with a safe-edge square file. The chisel should leave little stock for the file to remove; the filing should merely be a smoothing operation, as, with a little practice, it will be found easier to make and keep the seat straight and square with the chisel than it is to keep it square while filing a lot of stock from the sides and bottom.

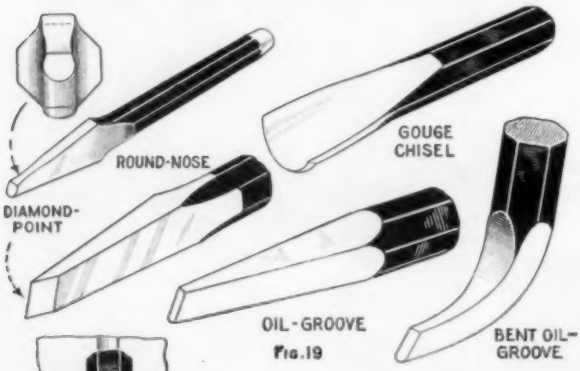


Fig. 19

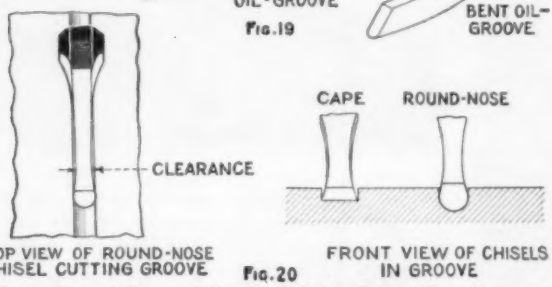


Fig. 20

Above, Several Types of Special Chisels; Below, How Cape and Round-Nose Chisels Should Be Forged and Ground

The seat in the pulley hub can be marked by rubbing the surface of the hole with chalk and rubbing it in with the finger, then laying off the width of the seat with the square. A very useful tool for the erector's kit, one that is a favorite with the English machinist, though not so often seen in this country, is a small steel T-square (Fig. 18). This is handier than the common square for marking off keyseats in pulleys and gears, and, as the blade is usually only about 5/16 or 3/8 in. wide, it will enter almost any hole that the erector may encounter. With the lines laid out on the inside of the hole to guide us, we shall not be long in cutting the keyway. A word of warning is pertinent here. It will usually be found necessary to clamp the pulley in the vise by means of one of the arms, and a block of soft wood (Fig. 17) should always be placed on each side of the arm, to prevent breaking it if the chip taken from the hole is a fairly heavy one. Also, the cape chisel used should be ground with a single bevel, as, if a double-bevel chisel is used, it must be held too high in order to force it to cut; this, in a long hub, means that the chisel shank strikes the upper edge of the hole before the chisel has gone halfway through. The cut should be stopped before the chisel has reached the opposite side of the hole, the pulley reversed in the vise, and the remainder of the seat cut from the opposite side, to prevent the end of the seat from chipping off.

Fig. 21

Fig. 22

Left, Bevel on Underside of Chisel; Right, Radius and Straight Bevels on Chisel Heads

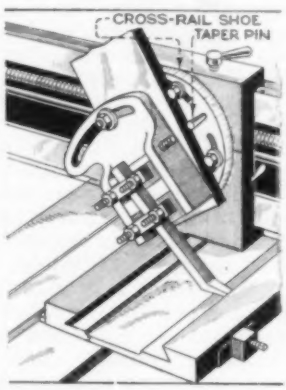
There are several other varieties of chisels, the most important of which are the round-nose, the diamond point, the C, or gouge or cow-mouth, and the oil-groove chisel. These are all shown in Fig. 19. The round-nose chisel is used for chamfering; for cutting small grooves; for chipping the ends of slots that are to be cut round, and, ground to a thin point, for drawing centers on drill-press work. The diamond-point chisel is used for cutting out square corners in slots, by boilermakers for cutting holes in steel plate, and for work of a similar character. It might be used, for example, in squaring the corners of the keyseats in the pulley and shaft that we just finished. It may have a slight bevel on the underside or the underside may be perfectly straight, depending on the work. The C, gouge or cow-mouth chisel (it is known by all three names) is a large round-nose chisel, with the blade hollowed out on the upper side somewhat like the carpenters' gouge. It is used for larger chamfers and grooves than the round-nose chisel, but otherwise its use is the same. The oil-groove chisel is nothing more than a fine-point round-nose chisel, made straight, like the common round-nose, for straight grooves, and bent, as shown in Fig. 19, for circular grooves; when made in the latter form, the radius to which it is bent must be less than that of the bearing in which it is intended to be used.

In all these chisels the point or cutting edge must be wider than the portion of the blade back of it, Fig. 20, and the bottom wider than the top, to provide clearance so that the chisel will cut cleanly and not wedge itself in the cut. When cutting soft metal, if the point is not wider than the remainder of the blade, the latter will wedge and throw up a burr on each side of the cut; this is especially likely to happen with the oil-groove chisel, and the burr must then be scraped off. In grinding a cape, round-nose, cow-mouth or diamond-point chisel for ordinary work, the underside of the blade may be beveled, as shown in Fig. 21. This permits the angle of the cutting edge to be changed in relation to the surface of the work by merely raising or lowering the hand. As this makes the angle more obtuse, it lessens the liability of the point of the diamond-point chisel to break, which is a pronounced fault in this chisel. However, when the work is deep, this bevel is a disadvantage, for the reason mentioned in connection with the cape chisel used for the keyseat, and the bottom of the chisel should therefore be ground straight for deep holes or slots. Chisels should be tempered to a purple for steel, and to a dark purple for cast iron. These colors correspond to temperatures of 530 and 550° F., respectively. This must not be taken as a hard-and-fast rule, as many chisels will work well when tempered to a dark blue (600° F.). When in doubt, temper a trifle soft, as there will then not be as much danger of breaking the tool.

The end of the chisel opposite to the "business" end is not ordinarily given the attention it merits. The head is usually left soft, with the consequence that the end "mushrooms" and presently becomes a positive menace, due to the little slivers of steel that are apt to fly off when the head is struck with the hammer. Chisels should never be permitted to get into this condition, but the ends should always be beveled as shown in the upper drawing, Fig. 22. This form of head has been found by one of the large automobile-building companies to be better than the usual straight bevel for preventing mushrooming and to have the additional advantage that glancing blows of the hammer do not cause chips of the head to fly off. The radius should be from ⅛ to ¼ of the diameter of the tool. A radius of ⅜ of the tool diameter has been found very satisfactory in service.

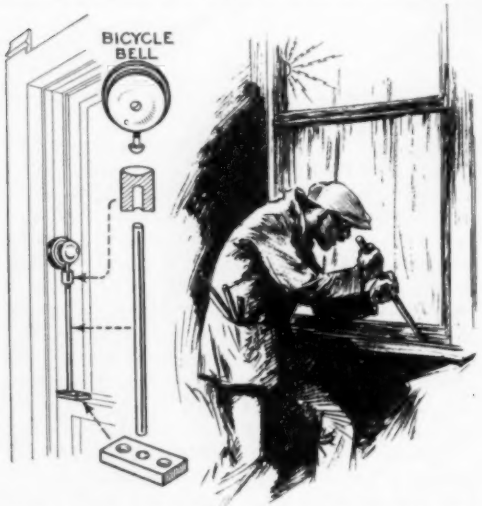
Index Pin Aids Planer Work

In shops where a large number of machine slides are planed a great deal of time may be saved by drilling and reaming a hole through the crossrail shoe and head to take a taper pin, as shown in the drawing, at the most often used angle. Thereafter, whenever a slide is to be machined, the head is swiveled to the angle and the pin slipped into place, thus bringing the head to the correct position at once, without readjustment. This also saves time in scraping the slides, as there is less variation in the machine work.—R. W. Laing, Fergus, Ontario.



Bicycle-Bell Burglar Alarm

The practical and inexpensive burglar alarm shown in the illustration is easy to install and will not get out of order easily,



Novel Burglar Alarm That Will Not Get Out of Order and Requires No Electric Current to Operate

due to its simplicity and durable construction. A regular bicycle bell of the kind that is wound up by turning the top portion and is rung by pressing a little button on the side, is mounted on one side of the window casing about 8 in. above the top edge of the lower sash. A 6-in. length of 3/16-in. rod is provided with a cap on the upper end, and fits snugly in a little metal plate screwed to the top of the lower sash, so that the moment the lower sash is raised about an inch or two the rod pushes against the button and causes the latter to ring.—H. Lungquist, Philadelphia, Pa.

Tilling Soils

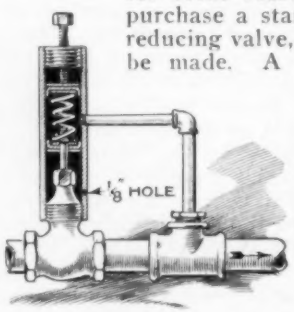
The exact method and time of tilling any soil depend upon the character and condition of the soil and the kind of crop to be raised on it. Soils that are inclined to be compact must usually be tilled frequently in order to preserve the moisture content. Fall plowing puts soil in good condition for absorbing and holding a considerable amount of winter water, which usually runs off the harder and more compact soils. The reason for this ability of a plowed soil to absorb so much water is that the number of air pockets between the soil particles is greatly increased by plowing, and the water is retained in these spaces. The deeper the tillage, the more water can be absorbed, but it is then also true that more water will be lost by evaporation unless a soil mulch is formed on the surface; a soil mulch is made by tilling the soil one or two inches in order to break the capillary connection between the lower soil and the surface soil, thereby reducing evaporation losses. Shallow plows and cultivators are used for making soil mulches. Disk harrows and curved-tooth harrows allow the ground to lose a considerable amount of water by evaporation as these implements cut deeply into the soil, leaving untouched ridges in a compact condition; the water rises readily in these ridges to the surface where it evaporates. Spring plowing has the beneficial result of returning to the soil some of the nitrates and other elements that have been leached down below the reach of plant roots, by turning the lower soil up to the surface and in this way increasing the fertility.

Making Blueprints on Heavy Paper

It is often desired to have a blueprint from a drawing made on heavy paper or Bristol board. The drawing is placed in a printing frame with the inked surface on the sensitized side of the printing paper, to preclude all possibility of blurring due to dispersion of the light when it passes through the thick paper. To get a clear-cut exposure, it is necessary to increase the brilliancy of the light and also the time of exposure, the degree of increase depending on the thickness of the paper.

A Homemade Pressure-Reducing Valve

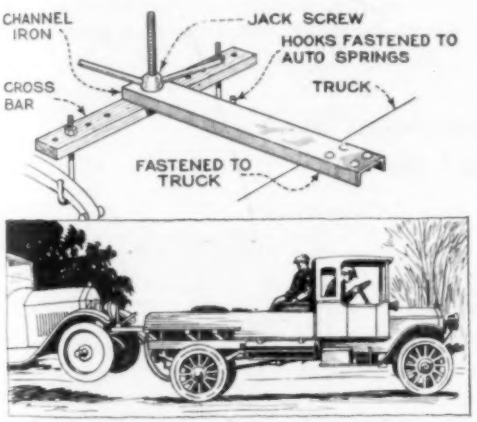
In experimental work, where steam, air, gas or water is used and variable pressures are required, and it is impossible, for some reason or other, to purchase a standard pressure-reducing valve, one can readily be made. A standard globe valve of the required size is fitted with a plain valve stem that will slide up and down. The top nut is removed and a thread cut in its place to fit a short length of brass tubing, which serves as a cylinder. A ½-in. hole is tapped and drilled in the side for a by-



pass pipe, and a plug is made for the other end of the cylinder. A ½-in. tapped hole is also provided for the pressure-regulating screw, and a spring, made of ⅛ or 5/32-in. wire, depending on the pressure, is placed between the top and bottom pistons, which consist of two washers and a cup leather each. By raising or lowering the adjusting screw the pressure in the delivery pipe can be varied.—Frank N. Coakley, Buffalo, N. Y.

Simple Towing Rig for Service Car

Service cars are usually equipped with more or less elaborate cranes, hoists and towing rollers. A simple towing rig, which will convert any truck into a service car and will work as well as the more expensive apparatus, is shown in the drawing. It consists of a length of heavy channel iron, one end of which is securely bolted to the truck floor, so that about 2 ft. extend in rear of it, a large iron plate being provided on the underside to take part of the strain. To the extending end a 4 by 4-in. crossbar is fastened with a jack screw. The length of the crossbar should be such that it will readily fit between the front wheels of any auto. A



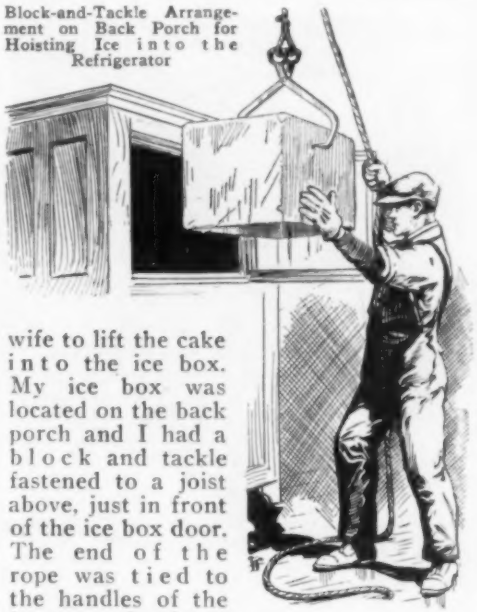
Convenient Towing Rig on Service Car Replaces Expensive Hoist and Can Be Made by Anyone

number of holes are drilled through it, as indicated, to take ½-in. round-iron hooks, bent to the shape shown and threaded for nuts that hold them to the crossbar. In use, the hooks are slipped under the springs or other extension parts of the car to be towed, and the front end raised by turning down the nut on the jack screw. Obviously, the outfit can also be used at the rear end of the disabled car.—G. A. Luers, Washington, D. C.

Hoisting Ice into Refrigerator

In some towns ice is not delivered but has to be brought from a distributing station. This makes it difficult for the house-

Block-and-Tackle Arrangement on Back Porch for Hoisting Ice into the Refrigerator



wife to lift the cake into the ice box. My ice box was located on the back porch and I had a block and tackle fastened to a joist above, just in front of the ice box door. The end of the rope was tied to the handles of the ice tongs, leaving a large loop so that large as well as small pieces would be "hooked" securely. It was then an easy matter to hoist a heavy cake of ice up to the ice chamber of the refrigerator and push it in.—Floy Bates, Hardin, Mo.

Coating Galvanized Iron Before Painting

Those who have attempted to paint galvanized iron, such as gutters and conductor pipes, have noticed that the paint peels off in a short time. This trouble can readily be overcome by first giving the galvanized surface a coat of the following solution: Copper chloride, 2 oz.; copper nitrate, 2 oz.; sal ammoniac, 2 oz.; water, 1 gal. After these ingredients have been thoroughly mixed; 2 oz. of hydrochloric acid are added. The solution should be mixed in a glass or stone container—not in a metal one. Give this coating a day or so to dry, and then apply at least one coat of lead and oil before putting on the finish coat of paint.

¶By putting moth balls in the tool box, one or two in each drawer, rusty tools will be prevented.

Effective Hog Oiler

Simple hog oilers are not hard to make, and, if constructed as shown in the illustration, will be found very sturdy and effective. It consists of a sturdy barrel mounted on a length of pipe, as indicated, so that it can revolve freely. A block of wood, with a hole partly drilled through it to receive the end of the pipe, serves as the lower bearing, and a bracket of flat iron attached to the side of the hog house, as the upper one. Pieces of grain sacks are tacked around the outside of the barrel. A can of oil is placed on a shelf inside of the hog house, and a length of rubber tubing is used to convey the oil to the sacking. A cock must, of course, be provided in this line. Opening the cock and giving the barrel a turn soaks the fabric with oil. The barrel should have some upward play so that the pigs can lift it a little to rub their backs.—C. M. Wilcox, Torrington, Conn.

Hog Oiler Made from a Sturdy Barrel Covered with Sacking Is Cheap and Effective

Handling Shellac Brushes

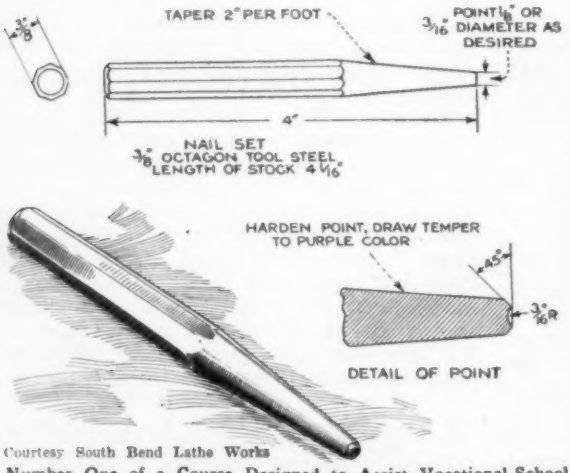
Shellac brushes should be used for shellac only. It is not necessary to clean them after each time they are used. Simply wipe off the surplus shellac and form the bristles so that none are straggling, then lay the brush away to dry. It will become hard in a short time. Before using it again, set it to soak in shellac. This will soften the bristles and in a few minutes the brush will be pliable again. Of course, after repeated use, it becomes more or less dirty or filled with dust, lint, or sawdust, and it must then be cleaned in alcohol. Turpentine, gasoline or kerosene should never be used for this purpose.—A. J. Harstad, Wolf Creek, Mont.

Job Sheets for Vocational Schools

No. I, Making a Nail Set

Material required:

Tool steel, ⅜-in. octagon by 4 1-16 in. long.



Courtesy South Bend Lathe Works

Number One of a Course Designed to Assist Vocational-School Teachers in Handling Machine-Shop Work

Operations:

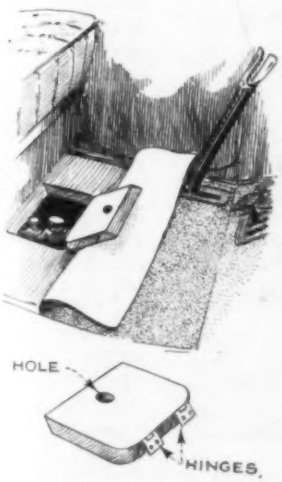
1. Select stock as per drawing.
2. Place steel in 4-jaw independent chuck with end projecting 2 in. Adjust jaws so stock runs true.
3. Arrange belt for proper spindle speed.
4. Set lathe tool for facing.
5. Face end.
6. Concave end. Use round-nose tool ground to 3-16-in. radius, setting tool on center.
7. Set compound rest at proper angle to obtain taper of 2 in. per ft. This is approximately 90 deg. to the right.
8. Set round-nose tool for taper turning.
9. Rough turn taper to approximate size, feeding toward headstock with compound rest screw.
10. Finish turn taper, using fine feed.
11. Set tool for chamfering.
12. Chamfer point as per drawing.
13. File tapered section lightly to remove tool marks.
14. Polish tapered section with emery cloth and oil.
15. Turn stock end for end in chuck, allowing end to project 1 in., and true as before.
16. Face end.
17. Chamfer corners.
18. Transfer to forge. Harden and temper taper end for distance of 1 in. from end, as per drawing.
19. Return to lathe and repolish.

Handy Shop Magnet

A handy magnet for use around the machine shop, garage or car can be made from an old Ford coil. Remove the case and the insulating compound by carefully squeezing it in a vise so that the windings will not be injured. The secondary winding, consisting of fine wire, is also removed, which can be done by hammering lightly and then slipping it off. The primary winding and the iron core inside are the parts to be used for the electromagnet. To the ends of the primary winding two 25-ft. lengths of flexible, insulated wire, such as lampcord, are attached. The other ends of the lampcord are connected to the terminals of a storage battery. The magnet will lift about 2½ lb. when connected to a 6-volt battery and about 4 lb. when connected to a 12-volt battery. It is advisable to wrap a few layers of tape over the winding on the magnet to protect it. Such a magnet will be found very useful for recovering bolts, nuts, wrenches and other articles dropped into the transmission of autos, and other places hard to get at. If the coil is well shellacked it may even be used in water.—F. B. Howell, Mendenhall, Miss.

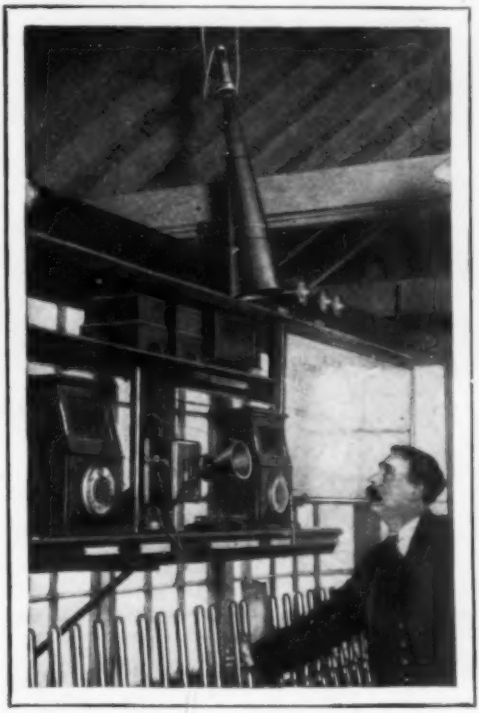
Greasing the Universal Joint

In most cars the floorboards have to be removed to get at the universal joint when it is necessary to grease it. To eliminate this inconvenience, a piece is sawed out of the board directly above the joint, as shown in the illustration. Hinges are provided on it and it is replaced, a small finger-hole being drilled on the other side to permit lifting it up whenever necessary. It will be found that this simple kink will allow one to get at the joint with equal ease and in less time than when the whole floorboard has to be removed.—Ralph T. Stewart, Winston-Salem, N. C.



Amplifying Telephone Speech

In railroad switch and signal houses where the noise of passing trains almost prohibits telephone conversation, it is a good idea to install a loud speaker as shown in the photograph. Besides amplifying the "call up," it enables speech to be heard in any part of the switch house even when a train approaches. The installation illustrated was made in a signal box near King's Cross, England.



Loud Speaker in Switch House Amplifies Telephone Conversation

Hoeing Large Weeds

When clearing a place for a garden, it is often found that the ordinary hoe will not cut the large weeds. A way to improve the hoe for this purpose and still leave it suitable for ordinary garden work is to file a number of shallow notches in it and to sharpen these like the teeth of a saw. A side motion of the hoe, with a little practice, will cut any weed encountered.—Arthur Flinner, Wichita, Kans.

Making a Bugle Violin

Any boy who is handy with tools can make the bugle violin shown in the illustration. It consists simply of a three-sided

Homemade Bugle Violin That Can Be Made by Any Boy

sounding box that has a single string stretched over it. Thin, dry wood is used for the box, and the pieces are glued together to give a good tone and prevent rattling. A bridge, similar to those used on violins, is used to raise the string, which is a catgut cello string, about an inch above the surface of the top. The neck is cut to fit inside of the narrow end of the body and is glued in place before the top is glued on. One peg is used to tighten the string. The other end of the string is knotted and slipped in a slot cut in the wide end of the top. An ordinary violin bow is used to produce sound, it being drawn back and forth over the string while the instrument is held in the manner indicated.—J. E. Noble, Toronto, Can.

Tempering Small Steel Instruments

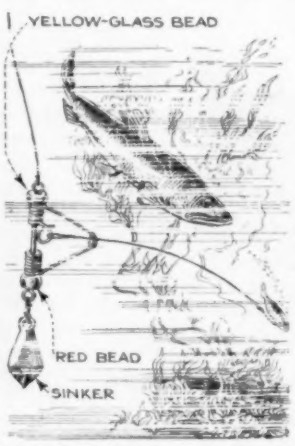
Small steel instruments, such as drills, dental instruments, or very fine tools of any sort, can be tempered in the following manner so hard that they will scratch glass, yet have the strength to stand up against hard work.

In a very small jar, mix one part common salt and two parts wheat flour with sufficient water so that it can be poured. It must not be thick and doughy, but thin enough to flow readily. The instrument to be tempered is heated in a small Bunsen-burner flame, turned low, or over a small spirit lamp. The spirit lamp is better, particularly if the instrument is very small. It is heated first to a temperature less than red heat, then the point is dipped into the salt and flour mixture. It will come out of the mixture coated with flour paste; it is then put into the flame, heated to a red heat and again quickly dipped into the mixture. The flour paste will be burned to charcoal and will protect the point from the direct action of the flame. It keeps the fine point from burning, and prevents any deleterious action on the delicate piece of steel.

The point is now cleaned off on a piece of emery paper, and the shank of the instrument, below the point, is inserted in the very tip of the flame, until the point is drawn to the proper color for the purpose for which it is to be used. The point must not be in the flame, but project through and out. The best dental instruments that can be made, those that will cut the enamel of the teeth and stand the hardest use, are tempered in this way.—J. H. Downie, San Antonio, Tex.

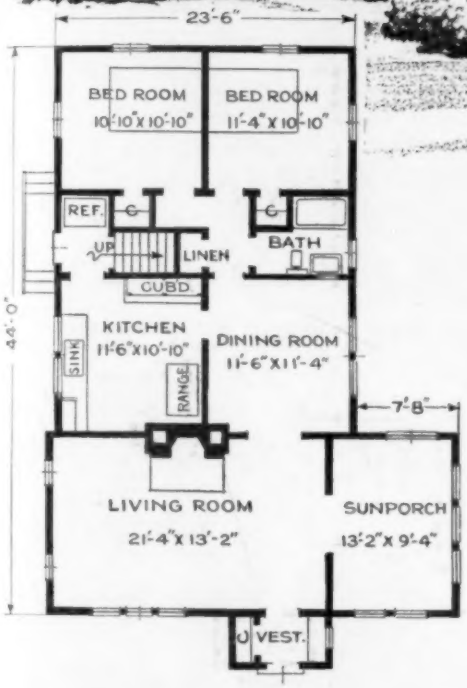
Improving the Swivel Hook

Taking advantage of the fact that bright colors attract many species of fish, the ordinary swivel used by salt-water anglers may be improved by removing the wire with the loops at each end to which the sinker and the line are attached, and substituting for the small glass beads that serve for bearings, two larger ones, one bright red and the other light yellow. If the wire that has been removed is found to be too short when the rig is assembled again, a longer one can easily be made by twisting a loop in the end of a heavy brass or copper wire, passing it through the beads and coil and then twisting a loop close to the end bead.



Five-Room House for Forty-Foot Lot

Plan No. 5A65



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THIS plan should appeal to home builders who demand the bungalow type of house at the lowest cost consistent with good construction. It has been designed to build inexpensively, as bungalows go. It can be placed on a forty-foot lot, although a wider frontage would be desirable, of course.

There are five rooms, bath, and sunporch, and plenty of closet space. If desired the sunporch can be made a part of the living room, and not separated from it by doors, or a plaster arch can be substituted for the partitions.

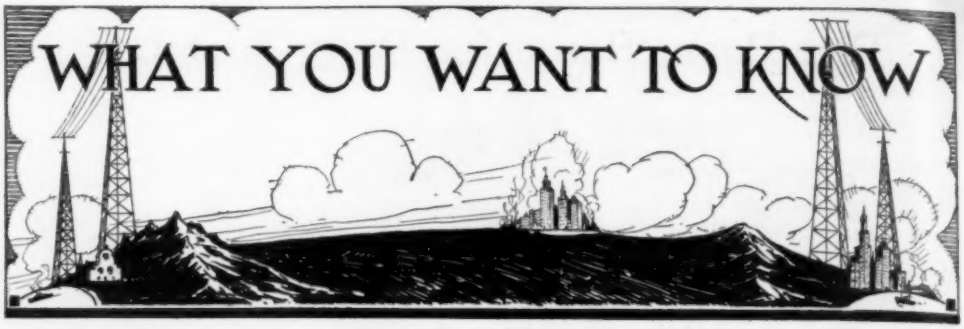
A fireplace occupies the inner wall of the living room in such a manner that the chimney stack may be had without additional expense to serve a coal-burning kitchen range.

Study of this plan will reveal many conveniences and economies, not only in housekeeping, but in construction. It is a frame house with exterior finish of wide siding, though shingles or stucco might be substituted. Even though this house is designed to minimize costs, it does not lack in attractiveness and architectural distinction.

The cost to build this house, including heating, plumbing, lighting, painting, ready to live in, but not including wall decorations, should range between $6,500 and $7,500. In certain localities where costs are high, the highest figure quoted would be too low. In other localities, the lowest figure quoted would be more than sufficient. The range of $1,000 is given to cover differences in the way the house is built, how thoroughly it is equipped and completed and in what district it is erected.

QUESTIONS regarding home building addressed to this magazine will be answered by the Architects' Small House Service Bureau of the United States, Inc., controlled by the American Institute of Architects and indorsed by the department of commerce, United States government. Blueprints, specifications and material lists for the bungalow shown above or other small homes may also be obtained at a nominal cost. Address Popular Mechanics Magazine, Chicago, inclosing self-addressed, stamped envelope for reply.

WHAT YOU WANT TO KNOW



Q. Will a C-battery increase amplification, and reduce distortion? If so, how should I connect it in my set? A. The diagram for connecting the C-battery is given. (See Fig. 1.) This battery is connected between the filament and the grid. It will add to the life of the B-battery as it decreases the amount of plate current necessary, reduces distortion, and gives better amplification. The C-battery should be connected to the negative of the A-battery as shown in the diagram. In many sets it is connected in series between the negative of the A-battery and the F posts on the transformers, the negative C-terminal being connected to the latter.

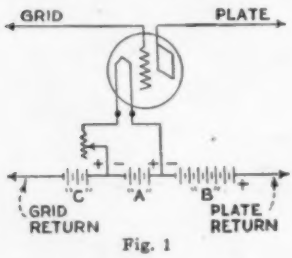


Fig. 1

Q. How can I make a good logging dial? Paper charts soon get dirty and have to be renewed. A. A simple method is shown in Fig. 2. Cut a disk of white Bristol board a trifle larger than the dial. Cut a hole for the condenser shaft, and fasten the paper disk to the panel with shellac or small machine screws. Cut a notch in the edge of the dial with a hacksaw in the manner shown, and file this out smooth. Scratch or engrave a short indicating line at the lower edge of the notch and fill in with Chinese white. Mount the dial on the shaft in the usual manner, and allow clearance for the paper disk. Tune in a station, and, at the point of best reception, put the call letters of the station on the paper disk, and a pencil mark that will be exactly opposite the white mark on the dial.

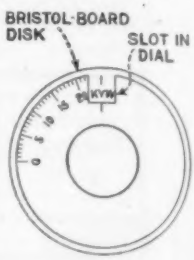


Fig. 2

Q. Please send me a diagram for adding two steps of amplification to any detector circuit. A. The diagram is given on this page. (See Fig. 3.) You will note that separate A and B-batteries are used for the detector unit. However, a low-voltage tap can be taken from the first B-battery unit for the detector plate and the same A-battery used.

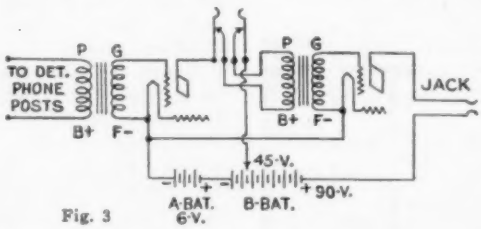


Fig. 3

Q. What is the advantage of the A-tubes over the 199 type? I wish to decide this point before building a receiver. A. The A tubes will give more volume, but require a 6-volt storage battery for operation. The 199 tubes can be operated on dry cells, take up less room, and make possible self-contained receivers.

Q. How can I tap off my loop, which is of the spiral-wound type? Will a tapped loop help selectivity? A. Mount a switch lever and four contact points on a 3-in. disk of bakelite. Fasten this disk to the base of the loop. Take a lead from each of the last four turns on the loop, and solder them to the switch contacts. The last turn of the loop should be on the fourth contact at the right. The connection to the set is made from the switch lever. A tapped loop will aid you in cutting out interference.

Q. My reflex receiver has always howled, how can I prevent this? A. Howls in reflex receivers are caused by regenerated audio frequency or by heterodyning. Fixed condensers of different values should be used as shunts across the transformers. Use as small a condenser as possible to get the desired result. Turning back the filament rheostat will sometimes give the desired effect, and reversing the transformer leads will often help. The last audio-stage wiring is always at a high audio-frequency potential, and must be kept away from the other wires as much as possible. Do not parallel these leads.

Q. Is there any way to eliminate or partly eliminate summertime static? I do not own a radio receiver, but would like to know what type is least affected by static. A. Static is always present in the warmer months and no simple means for entirely eliminating this interference has been discovered. A set that can be operated on a loop is the least affected. Distant reception in the "static months" does not compare with that obtained at other times with any type of receiver.

Q. Do the fire-insurance underwriters require a different type of ground to be used with transmitting set than with receiving set? A. Yes, the ground wire for a transmitting set should consist of No. 2 copper wire, protected from mechanical injury, and firmly supported on insulators throughout its entire length. Five inches clearance must be maintained from all other materials. A good ground must be obtained in all cases.

Q. I have a one-control radio-frequency receiver, and cannot tune to the higher wave lengths. What change must I make in the receiver to get these stations? A. If you are using a loop set, use a .0005-mfd. tuning condenser. Also try a .001-mfd. If an outdoor aerial is used, lengthen the aerial, or try a variometer in series with the aerial. It may be necessary to add a few turns of wire to the primary of the inductance.

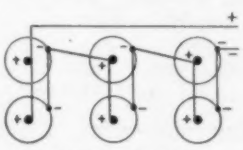


Fig. 4

Q. I have a 6-tube set using UV-199 tubes. How must I connect the dry cells for the A-voltage, and how long will they last? I am advised to connect them in parallel-series; how is this done? A. A diagram (Fig. 4) is given for connecting six No. 6 dry cells in parallel-series. The six tubes draw a total of .36 ampere. At this rate the approximate hours of service would be 180.